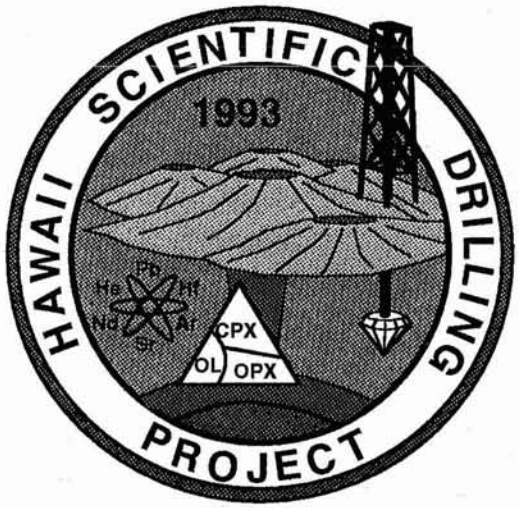
Don Thomas

CORE-LOGS

SUMMARY INFORMATION;
COMPOSITE LITHOLOGIC COLUMN;
LOGS FOR BOXES 1-354



HAWAII SCIENTIFIC DRILLING PROJECT

PRINCIPAL INVESTIGATORS

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PREFACE

Core-drilling for the first phase of the Hawaii Scientific Drilling Project (HSDP) took place from October 25 to December 10, 1993 at a site just east of downtown Hilo. A total depth of 3,464 feet (1,056 meters) was achieved with a recovery rate of greater than 90%. In parallel with the drilling, a major effort was undertaken to process the core in essentially real-time. This involved washing, marking, boxing, splitting, photographing, logging, and sampling the core. Keeping up with the highly successful drilling turned out to be a monumental task, but the team of dedicated geologists, most of whom were effectively volunteering their time, managed to do it. This volume represents a major achievement made possible by their dedication and hard work.

The summary lithologic column and the core-logs presented here are key building blocks for the success of the HSDP. They are the primary descriptions of the core. Using them as a framework, we hope that all of the team members can explore and examine what is available for study. They are effectively a road map for navigating the core and provide a common language for communication among the team members.

In the interests of keeping costs down, we have made the annotated digital photographs available here only in black and white at a resolution of 600 dpi. We have printed a few copies in color, but reproduction will be expensive and the resolution is only 300 dpi. If there is demand, we can make the lower resolution color version available. All of the color images (at full resolution), the lithologic column, and the entire log are available via the WWW on expet.gps.caltech.edu (a description is provided on pages 1-2 of this volume). Other information and figures are also available, and if any team members are interested in placing data, queries, or comments on this server for communication with the HSDP team, they should contact paul@expet.gps.caltech.edu.

This document represents an extraordinary effort by many people. The names of the loggers and others that helped with core handling are listed on the following page. Several people, however, deserve special mention. **Wayne Campbell** played a critical role in the design of the core recovery and handling procedures. He trained everyone in these procedures and oversaw all aspects of the core handling. It is difficult to overstate how much less would have been accomplished had he not been so generous and dedicated. Moreover, he was on-site every day, over the entire two month period of the drilling project. **Mike Baker** was also on-site every day for the entire two month drilling period. He logged much of the core and along with Wayne Campbell provided continuity and expertise on most aspects of the core handling. In addition, for the past six months, he has put in a major effort putting together this document, including annotation of the digital photographs, developing the Unit Summary, and proofing the logs and photographs. We hope it is obvious, but in case it is not, coming to grips with the information in the 354 core-boxes at the level of detail that is presented here was a monumental task, and Mike is the one who did it. **Mike Garcia** took on the task of designing the core-logging procedures, of coordinating all of the loggers and their work, and of checking all of the logs. This was an incredible effort. Without his patience, dedication, and willingness to share his remarkable experience with Hawaiian rocks and geology, the logs would be significantly less authoritative and accurate. **Paul Asimow** had the initiative to put all of this on the WWW, which will make access to the large amount of information presented here much easier for everyone, and will greatly facilitate dissemination of the results of the project. Finally, when everyone else was burned out, **Jeri Standfield** did most of the corrections on the data base and **Sally Newman** stepped in and proofread all of the core-logs several times.

This work was supported by NSF Grants EAR91-17588, -18573, and -18691.

Don DePaolo
Ed Stolper
Don Thomas

June, 1994

Loggers*

Mike Baker (MBB, California Institute of Technology)
Nicolas Binard (NB, IFREMER, Brest, France)
Wayne Campbell (WRC, United States Geological Survey, Denver)
Gail Eaton (GFE, University of California, Berkeley-Lawrence Berkeley Laboratory)
Mike Garcia, Chief Logger (MG, University of Hawaii, Manoa)
Tom Johnson (TJ, University of California, Berkeley)
John Lassiter (JCL, University of California, Berkeley)
Brent McInnes (BM, California Institute of Technology)
Bhaskar Rao (BR, University of Hawaii, Manoa)
Ed Stolper (EMS, California Institute of Technology)
Laura Wasylenki (LW, California Institute of Technology)
Laurie Watson (LLW, California Institute of Technology)
Huai-Jen Yang (HJY, Massachusetts Institute of Technology)

Other on-site participants

Dave Clague (United States Geological Survey, Hawaii Volcano Observatory)
Don DePaolo (University of California, Berkeley)
B. Lynn Ingram (Lawrence Livermore National Laboratory)
Judy Journeay (University of Hawaii, Hilo)
Jack Lockwood (JPL, United States Geological Survey, Hawaii Volcano Observatory)
Tari Mattox (United States Geological Survey, Hawaii Volcano Observatory)
Kelly Okano (University of Hawaii, Hilo)
Aaron Pietruzska (University of Hawaii, Manoa)
Don Thomas (University of Hawaii, Manoa)
Frank Trusdell (United States Geological Survey, Hawaii Volcano Observatory)
George Walker (GPLW, University of Hawaii, Manoa)

* Initials and institutional affiliations given in parentheses. The initials are used in the logs to indicate who did the logging on each core box.

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THE HSDP WWW SERVER

All the core photographs, the lithologic column, and the lithologic unit descriptions are presently available to investigators and the public via the **World Wide Web** (WWW), as explained here. This on-line service provides free, rapid interchange of text, graphics, and/or sound, and is user-friendly and self-explanatory.

What is the WWW?

The WWW is a group of internet-connected computers running programs called servers that distribute information in a format known as Hypertext Mark-up Language (HTML). Anyone with internet access and a client program such as NCSA Mosaic can connect to any server and download HTML documents, which can include text, graphics, sound, and binary programs. HTML allows the embedding of pointers or links to other documents anywhere on the WWW; these links are typically traversed simply by clicking on an appropriate bit of highlighted text in an HTML document. These links give the WWW its web-like quality, and allow such things, for example, as information residing on a computer in Hawaii to be found by connecting to the server at Caltech.

Accessing the WWW and the HSDP web server

To use the resources of the WWW, you need a client program. The most popular program currently available is **NCSA Mosaic**, available free from NCSA at **ftp.ncsa.uiuc.edu**. There are versions for Microsoft Windows, Macintosh, and X-Windows. You may also need to obtain suitable graphics display programs (such as JPEGview for Macintosh or XV for X-windows), which Mosaic calls to handle downloaded images (Mosaic also displays images internally, but cannot edit or manipulate them). Once you have downloaded and installed the client program, you can connect to our server by opening the URL (Uniform Resource Locator, the standardized addressing format used by the WWW) **"http://expet.gps.caltech.edu"**.

Information and formats on the HSDP server

Most of the information is presently reached using the **Index to Sensitive Maps of the Lithologic Column**, which has pointers to the 9 pages into which the column has been split and a table showing the boxes, runs, units, and depths covered by each page. Choosing the appropriate page brings up a picture of the lithologic column in **GIF** format (Compuserve Graphics Interchange Format; your display program should be able to convert this to other formats). You can download this image by clicking on the text "Download this page", or you can use it as a Sensitive Map, by clicking your mouse on a suitable part of the image. Clicking in one of the pink rectangles representing a Core Box will download the full-resolution color **photograph** (GIF format, typically 500x700 pixels and about 300 kilobytes) to the graphics viewing program which is linked to your client. You may have to adjust the brightness of the image for optimum contrast on your particular display. Since the images are sent to an external viewing program by Mosaic, the main Mosaic window should still be showing the page of the lithologic core.

At the time of this writing, there are two versions of every photograph available, one with annotations showing lithologic units and points of interest, the other directly off the photo-cd without annotations. You choose which one to download at the Index to Sensitive Maps. The raw images may be withdrawn if there is no interest in them.

The **descriptions** of the **lithologic units**, in tabular text format, are obtained by clicking on the lithologic unit numbers in the rightmost column of the Lithologic Column image. Each unit is described in every box in which it occurs, so clicking a lithologic unit number may bring up as many

as 20 descriptions. Find the section corresponding to the Core Box in question for discussion of the lettered points of interest annotated in the photographs.

The full column, all the photographs, and the lithologic descriptions (as well as a C program for interpreting the unlabeled description data files as HTML or plain text) can also be downloaded from simple directories without using the sensitive map system.

Online Sample Order Form

The server includes a **sample order form** which investigators can fill out and submit using Mosaic. The information given is e-mailed directly to the persons at Caltech responsible for distributing core sample.

Placing information on the server

If any investigator wishes to make data or results available to the rest of the HSDP community (and the world) via the WWW, there are two ways to do this. The preferred way is for you to set up your own server on a local internet-connected computer, to which a link will be placed on the central HSDP server at Caltech. The software needed to do this is also available free from NCSA, and is called HTTPD. The simpler path is to transmit the information to Caltech and make it part of the central server, kept on a local disk at Caltech. Contact paul@expet.gps.caltech.edu for details on either method.

Questions?

Any questions, comments, or suggestions should be sent to Paul Asimow, paul@expet.gps.caltech.edu. This resource exists to facilitate the work of HSDP and any ideas on improving its utility to the investigators are welcomed.

SAMPLE HANDLING PROCEDURES

General Statement[1]

The NSF Hawaii drilling project (NSF-HDP) will involve primarily the acquisition of continuous cores. This document describes the procedures to be followed for initial sample handling and subsequent splitting, core characterization, and sampling.

During drilling, cuttings may be collected as specified by the on-site Project Manager[2] in consultation with the Science Steering Group[3]. This may be particularly important if continuous coring does not provide adequate samples. Under the direction of the Sample Manager[4], cuttings will be collected, washed, and placed in properly labeled sample bags. These samples will be transported to the NEHLP core handling facility at Puna for indexing and sampling as required.

Samples of drilling fluid/mud may be collected as specified by the on-site Project Manager in consultation with the Science Steering Group. These samples of drilling mud and additives may provide crucial information on contamination of core and formation fluids. Under the direction of the Sample Manager, these materials will be collected and placed in properly labeled sample bags. These samples will be transported to Puna for indexing, sampling, and storage as required. Attention may need to be paid to preservation of these materials with stabilizing agents and proper storage.

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[1]This document was prepared prior to the start of drilling. Procedures evolved somewhat as the project got underway, and these changes are not reflected here. Wayne Campbell is preparing a revised description of what was actually done, and this will probably be published as a USGS Open File Report.

[2]Don Thomas or Roland Lawrence, who will share responsibility for interfacing with the drilling contractor at the drilling site.

3Don DePaolo, Ed Stolper, Don Thomas.

[4]Wayne Campbell (USGS Core Research Center).

At the Drilling Site

Since coring will be conducted using wire-line techniques, handling and curation procedures begin when the core-barrel liner is removed from the hole. An on-site Project Manager will be present or available at the drilling site at all times.

Removal of the core from the core barrel

Based on experience gained from the State of Hawaii's SOH project, it is assumed that project personnel do not have to be present to supervise or assist with removal of the core from the core-barrel liner; i.e., this can be left to the drilling crew. However, a schedule will be set up putting one member of our team on-call in case unforeseen circumstances arise; on-call shifts will be 12 hours, and at the start of the project and until it has been determined by the Sample Manager based on experience with the actual drilling crew that it is unnecessary, the on-call team member will be present at the drilling site when cores are recovered.

1. **The drilling and coring crew will remove the core from the inner tube and place it in a numbered 12' PVC tray in the on-site core handling shed.** When transferring the core sample, care will be taken to avoid disturbance or breaking of the core. Particular care must be taken to place the top of the core at the distinctively marked end of the PVC tray. The PVC trays will be permanently and securely mounted on 6" wide planks to prevent tipping, fitted with end caps, and fitted with PVC covers that can be secured with Velcro straps. Holes for drainage will be drilled at ~1' spacing in the PVC trays. The trays are to be pre-numbered sequentially and one end of each PVC tray will be distinctively marked to indicate the top of the core. The 12' trays will actually be made of two attached 6' lengths that can be detached to facilitate transport from the drilling site. Each of the 6' lengths will have been pre-labeled as section "A" and "B" of a single numbered core, and the tops of each 6' length will have been pre-marked.

2. **Each coring run will be given a sequential number starting with the number "R1" for the top of the hole. As soon as the core is received from the drilling contractor, a temporary label with this core run # and the top and bottom driller's depth is filled out with a water-proof felt tipped pen and affixed to the PVC tray.**

3. **A plasticized Core Recovery Form for each core run will also be filled out by the driller and attached with a clip to the PVC tray. Critical information to be recorded are the core number, driller's start and end depths, a preliminary visual estimate of the length of recovered core, and unusual situations relative to core recovery. Unusual features of particular interest (e.g., charcoal, fossils, glass, etc.) should also be noted.**
4. **The PVC top will be secured and the core tray will be placed in a safe, secure location at the drilling site.**

Transport of cores to Puna

At the start of his shift, the team member who is on-call for the drilling site will go to the drilling site, prepare the cores that have accumulated during the previous shift for transport to the Puna core handling facility, and transport these cores to Puna.

For each core run, the team member will:

5. **Verify the labeling of the PVC tray and the information placed by the driller in the Core Recovery Form.**

6. The next step is to separate the 12' long PVC tray into its two detachable 6' long trays for transport to Puna. **If it is already broken into appropriate lengths, the top half or so of the core will be slid up into the 6' long "A" tray and the bottom half or so will be slid into the "B" tray. If necessary, the core will be broken with a hammer at near its middle to allow this division of the core to be made. A mark with a waterproof marker will be made across the artificial break to indicate the location of the break and the orientation of the two broken fragments, and a notation will be made on the Core Recovery Form that a break was made. End covers will then be secured to the lower end of the "A" tray and the upper end of the "B" tray to keep the core from sliding out of the tray, and the PVC tops will be resecured with the Velcro straps.**

7. **The trays will be placed in a rack in the bed of a pickup truck**. Care should be taken to ensure that the trays are stable and secured for transport to the Puna core handling facility. It may be desirable to separate layers of PVC trays with lengths of 2x4's laying perpendicular to the PVC trays.

8. **Once all the core trays have been placed in the truck, the cores and the Core Recovery Forms for these cores will be driven to the Puna core handling facility.**

NEHLP (Puna) Handling and Sampling Procedures

It is critical that there be no smoking at the Puna facility, in order to avoid contamination of the cores with phosphorus and rare earths.

All rings should be removed before handling core.

9. **The core trays will be removed from the truck and laid out next to the core washing table.**

For each core run, the following sequence will be followed:

10. **The A and B trays for each core run will be placed on the core washing table. These trays will then be reattached, giving a single 12' long core tray containing the complete core run. The core will be washed carefully and thoroughly** using hoses, sponges, brushes, paper towels, etc. as core conditions permit.

11. **Unusual features (e.g., delicate glass-bearing sections or ash layers) will be photographed and noted. Special instructions for slabbing are to be noted on the Core Recovery Form (see #19).**

12. **The core will be aligned and fitted together where possible. Where any ambiguities exist. fracture match points will be marked with symbols (Δ, O, ◊, etc.) for visual assistance in fitting of pieces (Figure 1). Rubbly zones will be sealed in plastic bags. The length of recovered core will be measured and this more accurate value will be recorded on the Core Recovery Form. The top of the core being processed will be compared with the bottom of the previous core, and it should be noted on the Core Recovery Form whether these two pieces can be fit together.**

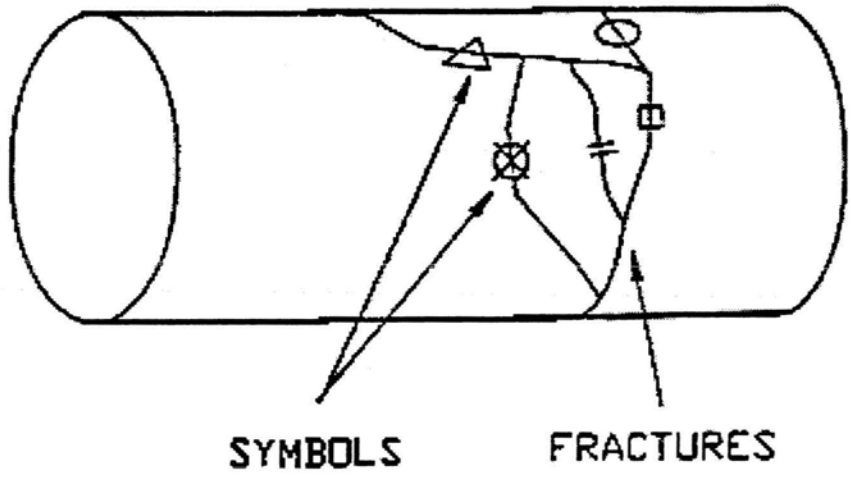

Figure 1. Schematic showing aligned core with symbols to indicate how the fragmented core fits together. From USGS Open File Report 89-496.

13. **The core will be marked for up-down orientation.** The surface of the core should first be dried with a blow dryer if necessary to facilitate writing on it with water-proof felt tipped pens. Core up/down orientation will be indicated by drawing two parallel lines on the

core with water-proof felt tipped pens — one black line and one red line which is to the right when looking up the core. This is illustrated in Figure 2. Note that these orientation lines are to be continuous across fracture breaks where the sample can be fitted together, but they are to terminate and restart with circumferential chords where there are mismatches across a break.

14. **Depth relative to the top of the core run will be marked and labeled on the core at one foot intervals with water-proof felt tipped pen (Figure 2). Depth intervals of rubbly zones will be estimated and marked on the enclosing plastic bags with water-proof felt tipped pen**; depth markings will continue on the solid core beyond rubbly zones based on these estimates. Each significant fragment of core should have at least one depth marking on it; this may require depth markings more frequently than at one foot intervals in some cases. **The RQD will be measured and the value entered on the Core Recovery Form. The RQD defined as the percentage of the core length that is in pieces longer than 10 cm. The measurement is to be done along the double pen marks indicating the up direction.**

15. **The core will then be broken into ~2.0' segments with a hammer. Again (as in step 12, above; Figure 1), where any ambiguities exist. fracture match points will be marked with symbols (Δ, O, ◊, etc.) for visual assistance in fitting of pieces. The core segments will then placed in corrugated plastic core boxes. A Styrofoam block labeled with the core run # and the starting driller's depth for that core run will be placed in the box with the first core segment from that core run just ahead of this segment. Similarly, a Styrofoam block labeled with the core run # and the ending driller's depth for that core run will be placed in the box with the last core segment from that core run just after this segment.**

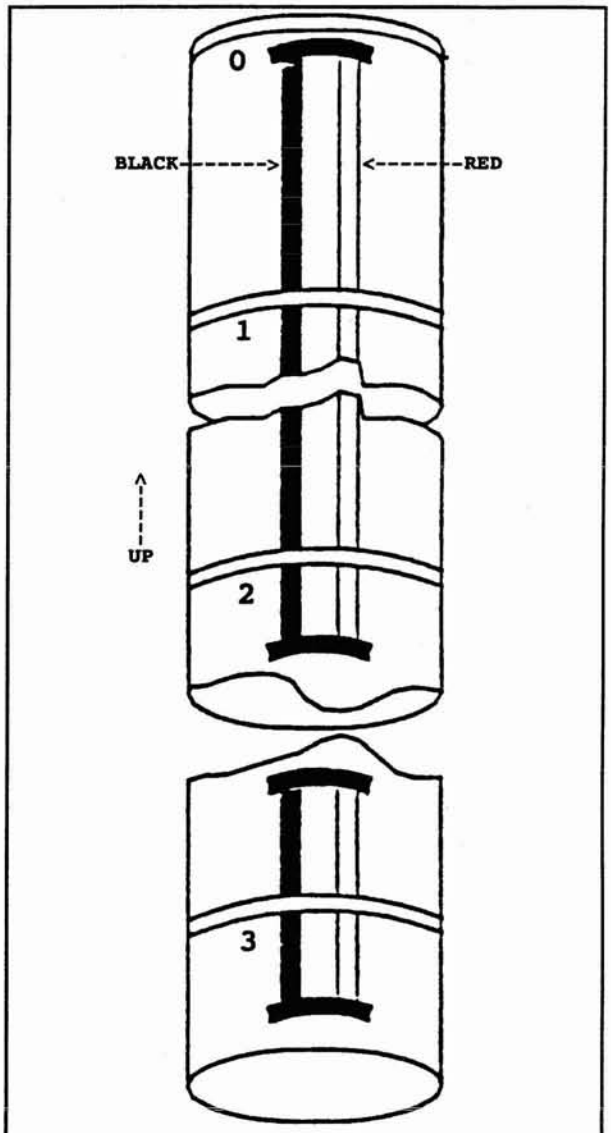

Figure 2. Illustration of core marking procedures, including double line (red on right when looking up the core) indicating orientation and relative depth markers every foot. Note that the orientation lines are continuous across breaks where the core fragments fit together, but are discontinuous across non-matching breaks.

16. **After each core box is filled, it will be labeled with water-proof felt tipped pen with the project name, the box #, the core run # (or #'s if the box contains material from more than one core run) and the driller's depth range of the core segment in the box.** The boxes have preprinted labels on the cover and two sides of the cover and the bottom; all should be filled out. ~~**The information on the box**~~

~~label will be added to the Core Box Record Form.~~ **The box # will be added to the Core Recovery Form and a Core Box Processing Check List will be begun for the box.**

17. **After placement in the core box, each fragment of core in the box and the bags of rubble will be labeled with water-proof felt tipped pen according to the core run # and the depth of the top of the fragment relative to the shallowest point of the coring run** (e.g., HDP3-4.6 indicates a fragment the top of which is 4.6' down from the shallowest part of coring run #3). **Any empty space at either end of the box will be filled with Styrofoam blocks to minimize movement of the core during transport. The top of the box will then be fitted over the box bottom.**

18. **After the entire core run has been boxed, each filled core box will be placed on the photo table. The box top will be removed and placed adjacent to the bottom of the box in such a way that the box label is visible.[5] A scale and color bar will be placed adjacent to the core box. The entire core box will be photographed for preliminary documentation in case the box is subsequently disturbed. An entry will be made in the 35 mm Photo Log for each photograph.**

19. **A longitudinal slab along the side of the core (1-1.25" thick) will be made of each core section.** This slab will become the Archive Split; the other slab is the Working Split. In general, it will be cut at 180° from the black and red orientation lines.[6]

    If a section of core contains special or oriented features that were noted at the drilling site (#3) on initial inspection of the core (#11) that should be preserved within the archive slab, at least in part, they will mark such sections of core for slabbing orientation. The slabbing orientation is to be designated by marking a line with slash marks pointing uphole on the outside surface parallel to the core's axis. The slabbing cut will then be made perpendicular to the plane containing this surface line and the core's axis as illustrated in Figure 3.

20. **The Working Split will be replaced in its core box. Any labels or markings obscured or removed during slabbing will be rewritten on the slab. The open core box will be placed under heat lamps until dry.**

21. **The Archive Split will be placed in core boxes specially provided by the USGS-CRC and to which labels indicating the core run #, the archive box #, and the top and bottom driller's depths have been attached. The archive box # will be entered on the Core Processing Check List. Each fragment of the Archive Split and each bag of rubble will be labeled with water-proof felt tipped pen according to the core run # and the depth of the top of the fragment relative to the shallowest point of the coring run. The up direction will be marked on each fragment and, if they do not appear on the Archive Split, the markings with felt tip pen every foot present on Working Split (see #14) will be put on the Archive Split. A Styrofoam block labeled with the core run # and the starting driller's depth for that core run will be placed in the core box with the first core segment from that core run just ahead of this segment. Similarly, a Styrofoam block labeled with the core run # and the ending driller's depth for that core run will be placed in the box with the last**

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[5] This may not actually be possible given the positions of the permanent labels on the box top, in which case we will have preprinted labels that we can place at one corner of the box top for this purpose.

[6] For delicate or fractured samples, the core may be wrapped in heat-shrink plastic prior to slabbing.

core segment from that core run just after this segment. Any empty space at either end of the box will be filled with Styrofoam blocks to minimize movement of the core. The box containing the Archive Split will then be placed under heat lamps until dry.

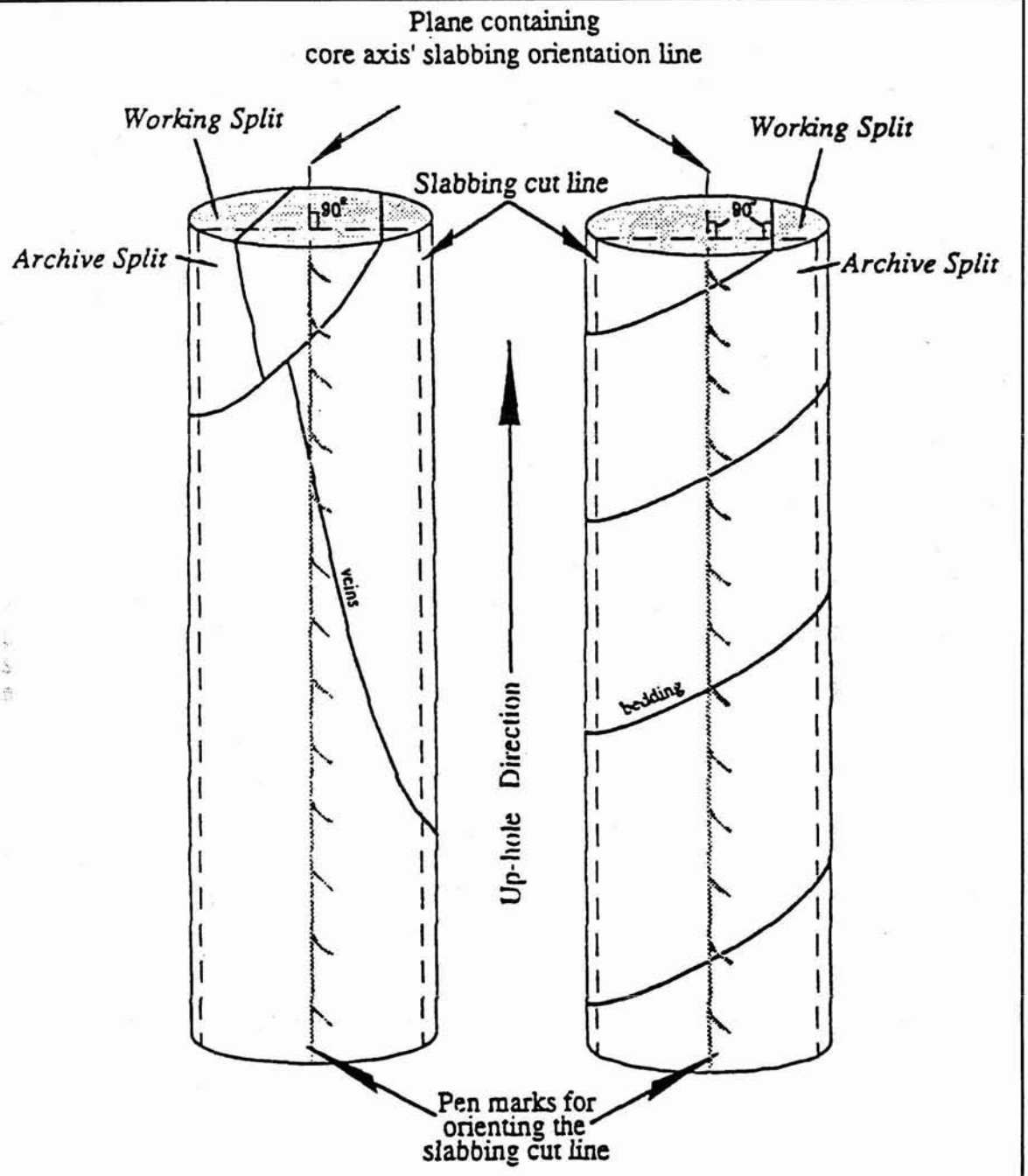

Figure 3. Examples of pen marks to indicate slabbing cut orientation. From USGS Open File Report 92-410.

22. **When it is dry, the open face of the Archive Split in the core box will be photographed as described in #18.** A camera and 35 mm Photo Log will be dedicated to Archive Split documentation.

23. **A piece of foam will be placed over the Archive Split to hold it in place, and the core box will be closed and sealed with nylon fiber tape. The Archive Split core box will be placed in a safe, dry place for storage.**

24. **When it is dry, the open face of the Working Split in its core box will be photographed as described in #18.** A camera and 35 mm Photo Log will be dedicated to Working Split documentation. **In addition a Polaroid print of each core box will be taken with a dedicated camera; the photograph will be recorded in the Polaroid Photo Log. The Polaroid photo will be placed in the core box.**

25. **The open face of the Working Split will be videotaped; the image will be scanned smoothly over the core recording as much detail as possible.** The box label should be recorded at the start of the recording for each core box. Between each core box recording, 15-30 seconds of blank tape should be recorded to facilitate editing and to prevent overlaps in filming. **An entry in the running Video Record Log should be made for each core box recording.**

26. **The core in each core box will then be logged.** Logging will be on standard forms to include those characteristics, readily identified in hand specimen, that will provide guidance in later sampling for project studies. Mike Garcia will be the Chief Logger; as such he is responsible for training the loggers and for reviewing all logs for accuracy and consistency. **Logging procedures are described in detail in an Appendix.** A checklist of macroscopic features is also provided to ensure consistent and complete descriptions; this checklist is included in the Appendix. Symbols, abbreviations, and lithologic types used in the core log are also given in the Appendix. **Immediately after each core box has been logged, the results will be transferred by the logger into a computerized data base.**

    It is expected that two loggers will be working simultaneously, each on a separate core box. After logging, each core box is closed and transferred to a safe location to await sampling.

On-Site Core Sampling Procedures

A critical aspect of the Science Plan for the Hawaii Drilling Project is the development of a set of reference samples for full geochemical and petrographic characterization. The goal is to provide a comprehensive geochemical data set on the sequential output of the Mauna Kea and Mauna Loa sections present over the depth interval that is cored. To this end, once logging has been complete on each core run, the Sampling Committee will choose intervals of the Working Split from which coarse- and fine-grained working powdered sample for distribution to team members will be prepared; thin section plugs and chips for rapid spot mineral analyses will also be prepared from the same section of core.

In cooperation with the Sample Manager or someone he designates, sections of core selected for sampling will be cut as illustrated in Figure 4. Based on the geometry illustrated in Figure 4, this procedure will preserve two longitudinal sections adjacent to the interior sample for further sampling by P.I.s who wish to prepare their own powders from the sampled region. The Sample Manager shall assign a unique sample number to each sample and make an entry in the On-site Core Sample Record. He shall also make careful records of the interval sampled, nature of the sample, time of collection, and prior handling. Styrofoam blocks will be labeled and placed in the core box in place of removed samples. Labeling of each fragment, powder, thin section, etc. will follow the procedures established for the Creede Caldera Moat Project (illustrated in Figure 5).

The interior piece will first be coarsely crushed. This powder will then be split approximately in half. One half will then be further ground. The coarse and/or fine powders will then be distributed to each P.I. involved in the analytical program; coarse powders will be sent to those investigators that desire mineral separates. One of the fragments adjacent to the interior fragment (see Figure 4) will be cut into oriented blanks for thin sections, then mailed to Caltech, which will arrange for polished thin sections to be prepared. Chips from the sampled interval will also be sent to Caltech for mounting as polished plugs for rapid phenocryst and/or glass analyses; results will be relayed back to the site and placed in the computerized log.

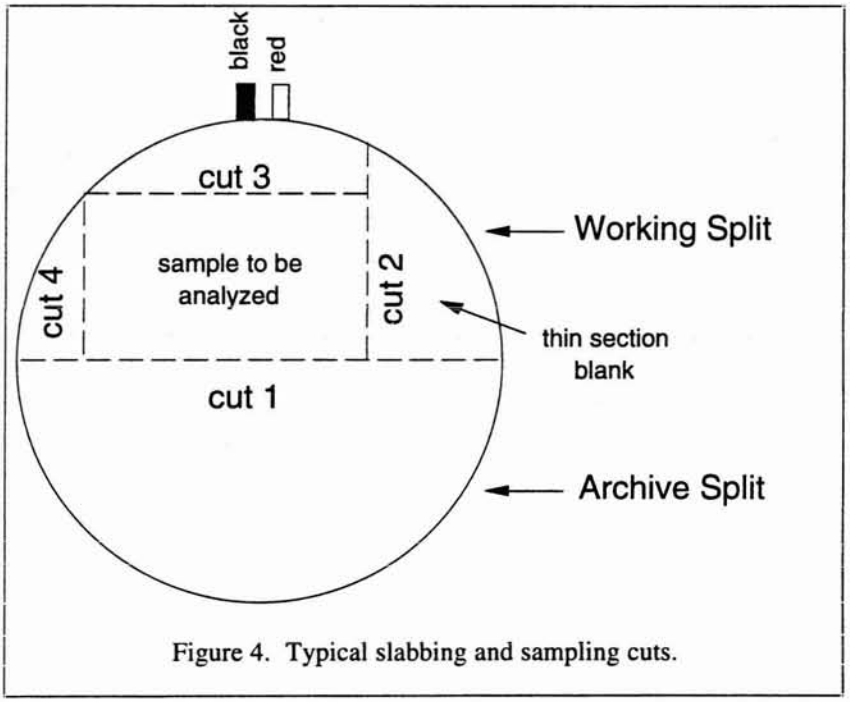

Figure 4. Typical slabbing and sampling cuts.

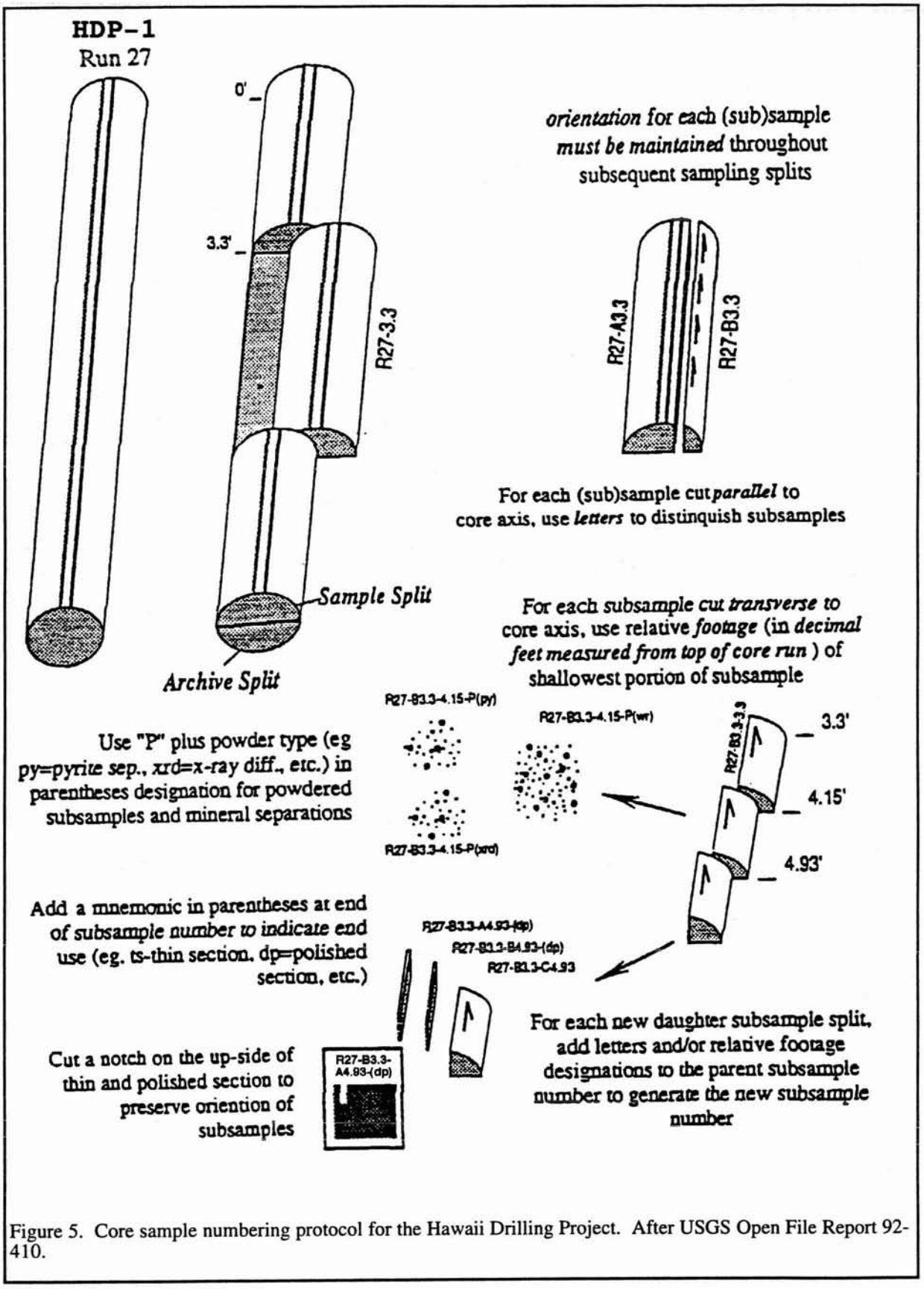

Figure 5. Core sample numbering protocol for the Hawaii Drilling Project. After USGS Open File Report 92-410.

This will be the extent of the organized, formal on-site sampling. However, with the written permission of the Sampling Committee, appropriate P.I.'s may also do on-site sampling as time and facilities permit. This must be done under the supervision of the Sample Manager, who shall assign a unique sample number to each sample, make an entry in the On-site Core Sample Record, and make careful records of the interval sampled, nature of the sample, time of collection, prior handling, name and location of the Principal Investigator, and purpose of sampling.

No samples shall be transferred from one P.I. to another or subsampled by another P.I. without the written permission of the Science Steering Group. If approved, appropriate records of the transfer must be kept by the H.I.G. or USGS-CRC Curator.

Sample Shipment to Curation Facilities

After the completion of drilling, all Working Split core boxes will be sealed with fiber tape and/or securely banded/strapped, mounted and secured to one or more palettes, then shipped to the H.I.G. for intermediate-term curation and storage. The H.I.G. will be responsible for the appointment of a Curator and for preserving the integrity of the samples during this period.

After the completion of drilling, the sealed Archive Split core boxes will be securely mounted and secured to one or more palettes, then shipped to the USGS-CRC for long-term curation and storage. No sampling or disturbance of the Archive Split shall occur without the written approval of the Science Steering Group or the ICG until after deaccession. After deaccession, the Archive Split will not be sampled if equivalent samples are available from the Working Split.

Off-Site Sampling

For a period of two years following completion of drilling the project samples shall be protected from general distribution to allow Principal and Secondary Investigators to complete their studies. During this time period, qualified P.I.'s may obtain permission to sample specific sections of core from the Sampling Committee. If permission is given, the P.I. may either travel to Caltech (where the Working Split will be curated for this period) to sample the core. No sample may be removed until assigned a unique identification number as described above, and careful records are made on the appropriate forms of the interval sampled, nature of the sample, time of collection, prior handling, name and location of the Principal Investigator, and the purpose of sampling.

At the end of the two year protected period the Science Steering Group shall establish a policy and set of procedures for general distribution of samples to other investigators with the approval of the ICG. The working sample will be securely packed and shipped to the U.S.G.S. Core Research Center (USGS-CRC). In addition, within two years after distribution of samples, all investigators shall return all samples and associated thin or polished sections, analyses, data compilations, etc., to the USGS-CRC Curator to be merged with the Archive Split unless other arrangements are made by the Science Steering Group and the ICG. In the event that written permission is obtained from the Science Steering Group to keep samples at an intermediate sample archive, the NSF retains ownership of these samples and is responsible for decisions on deaccession of such samples. Procedures for archiving drilling samples at the USGS-CRC will follow those in current use for CSDP samples.

True Depth Determination and Marking

After geophysical logging is completed, the Logging Contractor will correlate the downhole logs with the core logs to determine the true depth intervals of the coring runs. These depth

determinations will be sent to both the H.I.G. Curator and the USGS-CRC Curator. Scientists working on samples distributed prior to true depth determination will be notified by the H.I.G. Curator (or by the USGS-CRC Curator after transfer of the Working Split to the USGS-CRC) as to the true depth determinations. Samples should not be renumbered after true depth has been determined to reduce confusion and preserve consistency of sample numbering scheme.

LOGGING PROCEDURES

General statement

Logging, i.e., the hand-specimen scale description of the core, is critical to the success of the project since it provides guidance for all subsequent sampling and scientific study of the core. Logging was done only on the Working Split and only after slabbing. To ensure the quality and consistency of the core logging, two steps were taken. First, standard forms were used to act as checklists for the descriptions. Second, Professor M. Garcia served as the chief logger and trained all other loggers and reviewed all of the logged core to ensure consistency and accuracy.

Although it was not possible to anticipate everything that was recovered during coring, standardized forms were prepared assuming that nearly all of the rock would be either lava flows, pyroclastics, or shallow intrusive units. The description of procedures that follows assumes that the core to be described comprises such rock types. The logging procedures were modified on-site by Professor Garcia and the loggers as needed; this was particularly important for logging the sediments encountered in the upper parts of the core, for which we were basically unprepared. The procedures we used were based on ODP protocols (Shipboard Scientists Handbook, Ocean Drilling Program, Texas A&M University, ODP Tech, Note No. 3, 1985), procedures used at the Creede Caldera Moat Scientific Drilling Project (USGS Open File Report 92-410), and procedures used to log the SOH cores in Hawaii (USGS Open File Report 92-586).

Detailed logging procedures

For each core box, the following procedures were followed. Each logger had available a hand lens, rulers (metric and inches in tenths), a GSA color chart, notes on rock classification, figures showing visually different proportions of phases in two dimensions for help in estimating phase abundances, a clear plastic sheet with grid markings for point counting, and a binocular microscope.

1. A Core Logging Data Entry Form (HSDP-Form 10) was used for the description of the core box. Preprinted on the form were the top and bottom depth of core in the box, the percentage of core recovered, and the RQD (RQD is defined in item 14 of the Sample Handling Procedure, page 14 of this volume). The core logger entered the date the core was logged[1] and his/her name at the top of the form.

2. Each core box had a 3.25" X 4.25" Polaroid (Polacolor PRO 100 film) photo, which was annotated based on features described in the log.

3. The logger reviewed the Core Recovery Form for each of the core runs in the box being logged. These forms contained preliminary observations made by the drillers and the person(s) who washed and marked the core. These observations were incorporated, as appropriate, into the log.

4. The logger compared the top of the core in the box being described with the bottom of the core in the preceding box to determine if there was a change in lithology. If they were continuous, this was noted on the Core Logging Data Entry Form for Box Unit 1. Even in those cases where the core was continuous from one box to the next, each box was logged fully.

5. The core in each box was subdivided into units (numbered from 1 to n, from the top of each box) based on the presence of contacts (based on, for example, abrupt changes in lithology such

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[1] Underlined items indicate labeled fields on the Core Logging Data Entry Form.

as phenocryst abundance, grain size, vesicularity; or the occurrence of glassy margins, baked contacts, or sediments). The goal was to identify distinguishable flows rather than subdivisions of a single flow. The unit boundaries were marked on the Polaroid Photo. Top and bottom depths of the unit boundaries relative to the tops of core runs were entered on the Data Entry Form. (Depths relative to the top of each core run had been marked previously on the core in 1 foot intervals.)

6. For each unit in the box, the logger identified the following. (Note that there was a separate page of the Core Logging Data Entry Form for each unit described):

a. The unit was identified as a flow (**aa**[2], **transitional**, **pahoehoe**, **massive**), a pyroclastic unit (**ash**), a **hyaloclastite** or **breccia**, or a **dike**, **soil** or **sedimentary** deposit. Comments were entered as appropriate as unit type comments.

b. The total abundance of all phenocrysts in volume % as a percentage of the whole rock sample (including vesicles) was determined by a point count or visually estimate. Values were chosen from the following specific ranges: **aphyric (<1%)**, **sparsely phyric (1-2%)**, **moderately phyric (2-10%)**, **highly phyric (>10%)**. Comments on the overall phenocryst population, such as a homogeneous vs. heterogeneous distribution, grading, etc., were added as appropriate.

c. The phenocryst (≥1 mm) mineralogy was described. For each phenocryst phase (**olivine, clinopyroxene, plagioclase**), its abundance in volume % (**<1%**, **1-2%**, **2-10%**, **>10%**), its average size in mm (**<1**, **1-5**, **>5**), the typical shape (**blocky (<3:1:1)**, **tabular (>3:1:1)**, **anhedral**, **equant**), and the presence of alteration phases of the phenocryst phase (**iddingsite**, **clay**, **calcite**, **zeolite**, **silica**, **pyrite**, **epidote**, **gypsum**, **anhydrite**, **chalcopyrite**, **Fe-oxide**) were described. Comments on the individual phenocryst phases (phenocryst comments) such as the relationships to other phenocrysts or relationships among alteration phases were added as needed.

d. The color (dry) of the core was determined using the GSA color chart as a reference.

e. The groundmass texture was determined (**glassy**, **microcrystalline**, **fine-grained (<1 mm)**, **medium-grained (1-5 mm)**, **coarse-grained (>5 mm)**). Comments on the groundmass (e.g., grain size changes within the unit) were added as needed (groundmass comments).

f. The vesicle abundance in volume % (**<5%**, **5-10%**, **10-20%**, **20-30% and >30%**), the average size in mm (**<1**, **1-5**, **>5**), the shape (**spherical**, **sub-rounded**, **sub-angular**, **angular**), the aspect ratio (**equant**, **horizontally elongated**, **vertically elongated**, **inclined** — if inclined, the dip relative to the axis of the core was recorded), and any vesicle fillings (**clay**, **calcite**, **zeolite**, **silica**, **pyrite**, **epidote**, **gypsum**, **anhydrite**, **chalcopyrite**, **Fe-oxides**) were determined. Comments on the vesicles (vesicle comments) such as their distribution in the unit, the fraction filled, etc., were described. Any miarolitic cavities that were present, including information on their abundance, size, shape, distribution, and fillings, were noted and described.

g. The extent of alteration (abundance in volume %) of the core as a whole (not along fractures, following ODP style) was estimated and entered on the entry form (**fresh (<2% altered)**, **slightly altered (2-10% altered)**, **moderately altered (10-40% altered)**, **highly altered (40-80% altered)**, **very highly altered (80-95% altered)**, **completely**

[2]Bold items indicate choices available on a "pop-up" menu in the data base.

altered (95-100% altered) along with the alteration mineralogy (**clay**, **zeolite**, **silica**, **pyrite**, **epidote**, **gypsum**, **anhydrite**, **chalcopyrite**). Comments on the alteration such as the distribution in the unit, type (e.g., vein or fracture filling), grain size, etc., were added as needed.

h. The veins and fractures present in the unit were described. Significant ones were noted on the Polaroid Photo. Typical features were described (% present, their orientation, fillings and relationships, etc.). In addition, the extent of fracturing was estimated based on the number of fractures/foot (unfractured; weakly fractured, <4 fractures/ft; moderately fractured, 4-10 fractures/ft; highly fractured, >10 fractures/ft).

i. Any additional comments on the unit were added. When practical, to avoid ambiguity or uncertainty in the future about precisely what was being referred to, any features of interest were noted on the Polaroid Photo. A letter and description was generally given to each feature on the photo (e.g., "A").

j. Finally, the unit was given a rock name. Rock names were based on the IUGS classification system where possible (IUGS subcommission on the systematics of igneous rocks, 1973). For the most part, rock names were based on the abundance and identity of phenocryst phases; i.e., a basalt with 2-10% total phenocryst content with both olivine and plagioclase phenocrysts (but olivine>plagioclase) was called a "moderately plagioclase-olivine phyric basalt," following the IUGS style.

When steps 6a-6j were completed for each unit, the core was returned to the box, and replaced in the appropriate rack or storage place. The several pages of the Data Entry Form and the Polaroid Photo were clipped together.

The logger entered the data from the Data Entry Form into the Filemaker Pro 2.1 database immediately upon completion of the log. The original data sheets were filed for reference.

Within a few days, Professor Garcia reexamined the core and reviewed the completed log. Corrections, ambiguities, additions were agreed upon between Garcia and the primary logger, then entered into the Filemaker Pro data base. A completed Core Logging Summary Sheet was printed out and filed.

Post-logging procedures

All of the logging was done at the Puna facility within a few days of recovery of the core. Over the next several months, additional tasks were completed.

1. Identified units were numbered sequentially from the top to the bottom of the core (up to this point, they had only been numbered sequentially within each box). There are 227 such identified units. The unit names, positions, thicknesses, and notes are listed in the Unit Summary included in this volume (pages 54-65). Positions of internal flow contacts (e.g., separating overlapping lobes of pahoehoe flows that were parts of a single eruptive unit) are also listed. Depths in the Unit Summary are based on the table of revised depths of the tops of the core runs included in this volume (pages 32-43). These depths are relative to the rotary table on the drill rig; to convert these depths to depths relative to sea level, add 4.22 m (13.8 ft). Although for some purposes it may be necessary to correct to sea level, to avoid confusion, depths should in general be reported without applying this small correction to sea level; when the sea level correction has been applied, this should be clearly stated.

No effort was made to modify the unit boundaries chosen by the loggers, although there was clearly considerable subjectivity in the identification of distinguishable units by the loggers. For

example, some ash or soil layers were called out as separate units, while others were included as parts of larger units. Some internal flow contacts were chosen as unit boundaries, while others were not, and still others were ambiguous or unrecognized.

2. The 35 mm photographs of each core box were developed as Kodak Photo CDs. The intermediate resolution images (768 x 512 pixels) were opened as Canvas documents, and the notations made on the Polaroid photographs were transferred to the Canvas images. (Note that the Photo CDs contain much higher resolution images of each box – 2048 x 3072 pixels – and these can be made available over the internet if there is any interest.) Unit boundaries were added to the photographs as solid lines; internal flow contacts were drawn as dashed lines. The images were stored both as Canvas files (~1 MB each) and in a compressed form (~40-100 KB each). The compressed images are those printed in this volume adjacent to the written logs. The higher resolution (768 x 512 pixels) Canvas images are available on the WWW (converted from 24 to 8 bit color).

3. The logs and digital images were proofed several times and minor changes were made to remove inconsistencies and errors.

4. The composite lithologic column (pages 66-79 of this volume) was constructed to reflect accurately the logs and the Unit Summary. Depths of unit boundaries on the lithologic column are from the Unit Summary. Mauna Loa units are shown in light blue; Mauna Kea units are shown in green; sediments, soils, and ashes are shown in a "peach" color. This color scheme should be used by all team members. Note that the gray-scale of individual basalt units on the lithologic column is precisely proportional to the phenocryst abundance based on the point counts (i.e., darker units are richer in phenocrysts).

Shown graphically to the left of the lithologic column are the top and bottom depths of each core run (in brown), and the top and bottom depths of the core in each core box (in pink) and in each archive box (in cyan). These depths are raw driller's depths, uncorrected for the revised depths to the top of each core run, for incomplete recovery, or for sea level. Note that because the lithologic column *is* corrected for the revised depths to the top of each core run and because of the procedures used to label the core boxes, there are at some places mismatches of up to several feet between the lithologic column and the indicated depths of the boxes and/or core runs.

CORE RUN DEPTH LOG
(p. 1)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
1	26.0	30.0	4.0	5.3	133	49	1	2
2	30.0	32.0	2.0	3.9	195	36	2	3
3	32.0	37.0	5.0	5.1	102	73	3	4
4	37.0	42.0	5.0	5.2	104	65	5	6
5	42.0	47.0	5.0	6.0	120	30	6	8
6	47.0	52.0	5.0	1.1	22	0	8	8
7	52.0	57.0	5.0	0.0	0		8	8
8	57.0	61.0	4.0	2.4	60	0	8	9
9	61.0	62.5	1.5	0.8	53	0	9	9
10	62.5	65.0	2.5	1.7	68	0	9	9
11	65.0	70.0	5.0	3.9	78	36	9	10
12	70.0	72.0	2.0	1.4	70	0	10	11
13	72.0	72.5	0.5	1.2	240	0	11	11
14	72.5	77.5	5.0	3.2	64	16	11	12
15	77.5	82.0	4.5	2.3	51	0	12	12
16	82.0	84.0	2.0	1.4	70	0	12	13
17	84.0	87.0	3.0	0.7	23	0	13	13
18	87.0	88.5	1.5	2.4	160	0	13	13
19	89.0	92.0	3.0	5.7	190	39	13	14
20	92.0	92.5	0.5	1.7	340	0	15	15
21	92.5	95.5	3.0	3.8	127	32	15	15
22	95.5	100.0	4.5	3.3	73	0	16	17
23	95.5	100.0	4.5	0.0	0		17	17
24	100.0	100.0	0.0	0.0	0		17	17
25	100.0	104.0	4.0	3.9	98	15	17	18
26	104.0	106.5	2.5	2.0	80	0	19	19
27	106.5	110.5	4.0	1.5	38	40	19	19
28	110.5	114.0	3.5	3.4	97	0	20	20
29	114.0	119.0	5.0	4.3	86	0	21	22
30	119.0	122.0	3.0	0.0	0	?	22	22
31	122.0	132.0	10.0	5.5	55	0	22	22
32	132.0	142.0	10.0	5.4	54	0	24	25
33	142.0	152.0	10.0	3.3	33	0	25	25
34	152.0	162.0	10.0	2.0	20	0	26	26
35	162.0	164.0	2.0	3.8	190	0	27	27
36	167.0	172.0	5.0	4.1	82	0	28	28

CORE RUN DEPTH LOG
(p. 2)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
37	172.0	176.0	4.0	4.2	105	0	29	30
38	176.0	181.0	5.0	4.0	80	0	30	31
39	181.0	185.0	4.0	2.5	63	0	31	31
40	185.0	192.0	7.0	4.6	66	59	31	32
41	192.0	196.5	4.5	3.8	84	71	33	34
42	196.5	199.5	3.0	2.7	90	59	34	35
43	199.5	203.5	4.0	2.9	73	38	35	35
44	203.5	206.5	3.0	2.6	87	0	36	36
45	206.5	207.0	0.5	0.8	160	0	36	37
46	207.0	210.5	3.5	3.8	109	50	37	37
47	210.5	214.0	3.5	3.0	86	13	38	39
48	214.0	214.0	0.0	0.5	5000	100	39	39
49	214.0	217.0	3.0	2.5	83	84	40	40
50	217.0	222.0	5.0	4.9	98	73	40	40
51	222.0	227.0	5.0	5.2	104	79	40	41
52	227.0	231.5	4.5	3.8	84	92	41	41
53	231.5	236.5	5.0	5.2	104	60	41	41
54	236.5	241.5	5.0	5.3	106	70	42	42
55	241.5	247.0	5.5	5.4	98	89	42	43
56	247.0	252.0	5.0	5.0	100	56	43	44
57	252.0	257.0	5.0	5.1	102	94	44	44
58	257.0	262.0	5.0	5.0	100	50	44	45
59	262.0	267.0	5.0	5.2	104	85	45	45
60	267.0	272.0	5.0	4.9	98	82	45	46
61	272.0	277.0	5.0	5.3	106	83	46	46
62	277.0	282.0	5.0	4.8	96	81	47	47
63	282.0	287.0	5.0	5.3	106	100	47	48
64	287.0	292.0	5.0	4.8	96	100	48	48
65	292.0	297.0	5.0	5.2	104	96	48	49
66	297.0	302.0	5.0	4.5	90	98	49	49
67	302.0	307.0	5.0	5.0	100	92	49	50
68	307.0	312.0	5.0	5.0	100	100	50	50
69	312.0	317.0	5.0	4.4	88	93	50	51
70	317.0	322.0	5.0	4.8	96	69	51	51
71	322.0	327.0	5.0	5.2	104	67	51	52
72	327.0	332.0	5.0	5.2	104	63	52	52

CORE RUN DEPTH LOG
(p. 3)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
73	332.0	337.0	5.0	5.1	102	82	53	53
74	337.0	342.0	5.0	4.9	98	76	53	54
75	342.0	347.0	5.0	4.9	98	88	54	54
76	347.0	352.0	5.0	5.2	104	94	54	55
77	352.0	357.0	5.0	5.2	104	79	55	55
78	357.0	362.0	5.0	5.1	102	35	55	56
79	362.0	367.0	5.0	4.5	90	82	56	56
80	367.0	372.0	5.0	4.9	98	94	56	57
81	372.0	377.0	5.0	5.0	100	98	57	57
82	377.0	382.0	5.0	5.0	100	100	57	58
83	382.0	387.0	5.0	5.2	104	100	58	59
84	387.0	392.0	5.0	5.1	102	100	59	59
85	392.0	397.0	5.0	5.3	106	75	59	60
86	397.0	402.0	5.0	5.2	104	65	60	60
87	402.0	407.0	5.0	5.2	104	90	60	61
88	407.0	412.0	5.0	4.6	92	93	61	61
89	412.0	417.0	5.0	4.2	84	45	61	62
90	417.0	422.0	5.0	4.5	90	78	62	62
91	422.0	427.0	5.0	5.2	104	94	62	63
92	427.0	432.0	5.0	4.5	90	91	63	63
93	432.0	437.0	5.0	5.0	100	52	63	64
94	437.0	442.0	5.0	4.4	88	75	64	64
95	442.0	447.0	5.0	5.3	106	100	65	65
96	447.0	452.0	5.0	4.9	98	100	65	66
97	452.0	457.0	5.0	5.3	106	94	66	66
98	457.0	462.0	5.0	4.4	88	100	66	67
99	462.0	467.0	5.0	5.1	102	100	67	67
100	467.0	472.0	5.0	4.9	98	92	67	68
101	472.0	477.0	5.0	5.1	102	84	68	68
102	477.0	482.0	5.0	4.9	98	100	68	69
103	482.0	487.0	5.0	5.2	104	87	69	69
104	487.0	492.0	5.0	5.1	102	100	69	70
105	492.0	497.0	5.0	5.3	106	100	70	70
106	497.0	502.0	5.0	4.4	88	100	70	71
107	502.0	507.0	5.0	5.2	104	94	71	71
108	507.0	517.0	10.0	10.0	100	98	71	72

CORE RUN DEPTH LOG
(p. 4)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
109	517.0	527.0	10.0	10.0	100	98	72	73
110	527.0	537.0	10.0	9.7	97	94	73	74
111	537.0	547.0	10.0	10.5	105	49	74	76
112	547.0	557.0	10.0	6.0	60	17	76	76
113	564.0	574.0	10.0	10.3	103	65	76	77
114	574.0	584.0	10.0	9.7	97	74	78	79
115	584.0	594.0	10.0	9.7	97	87	79	80
116	594.0	604.0	10.0	10.2	102	83	80	81
117	604.0	609.0	5.0	5.2	104	73	81	81
118	609.0	612.0	3.0	3.1	103	10	81	82
119	612.0	617.0	5.0	1.8	36	100	81	82
120	617.0	626.0	9.0	9.7	108	64	82	83
121	626.0	632.0	6.0	6.8	113	91	83	84
122	632.0	639.0	7.0	5.3	76	66	84	84
123	639.0	640.5	1.5	1.8	120	0	84	85
124	640.5	647.0	6.5	3.6	55	0	85	85
125	647.0	657.0	10.0	10.1	101	100	85	86
126	657.0	667.0	10.0	9.9	99	97	86	87
127	667.0	677.0	10.0	10.0	100	81	87	87
128	677.0	686.0	9.0	8.6	96	52	88	89
129	686.0	696.5	10.5	10.0	95	63	89	90
130	696.5	707.0	10.5	10.5	100	87	90	91
131	707.0	717.0	10.0	9.0	90	59	91	92
132	717.0	727.0	10.0	10.0	100	92	92	93
133	727.0	737.0	10.0	10.2	102	100	93	94
134	737.0	747.0	10.0	9.4	94	87	94	95
135	747.0	757.0	10.0	9.5	95	68	95	96
136	757.0	767.0	10.0	2.6	26	35	96	96
137	767.0	772.0	5.0	0.5	10	0	97	97
138	772.0	777.0	5.0	0.1	2	0	97	97
139	777.0	784.0	7.0	0.5	7	0	97	97
140	784.0	789.0	5.0	3.2	64	16	97	97
141	789.0	789.5	0.5	0.0	0		97	97
142	789.5	799.0	9.5	9.5	100	47	97	98
143	799.0	807.0	8.0	6.5	81	40	99	99
144	807.0	809.0	2.0	0.8	40	0	99	99

CORE RUN DEPTH LOG
(p. 5)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
145	809.0	817.0	8.0	8.5	106	31	99	100
146	817.0	825.5	8.5	8.4	99	12	100	101
147	825.5	835.5	10.0	0.0	0		101	101
148	835.5	846.0	10.5	3.9	37	0	101	102
149	847.0	853.0	6.0	4.3	72	65	102	102
150	853.0	863.0	10.0	6.6	66	53	102	103
151	863.0	873.0	10.0	10.2	102	100	103	104
152	873.0	880.5	7.5	7.0	93	100	104	105
153	880.5	887.5	7.0	7.2	103	100	105	105
154	887.5	897.0	9.5	9.6	101	96	105	105
155	897.0	907.0	10.0	10.1	101	100	106	107
156	907.0	917.0	10.0	4.9	49	90	107	108
157	917.0	927.0	10.0	5.8	58	67	108	109
158	927.0	937.0	10.0	9.8	98	95	109	110
159	937.0	947.0	10.0	9.9	99	73	110	111
160	947.0	957.0	10.0	9.8	98	80	111	112
161	957.0	963.0	6.0	4.5	75	18	112	112
162	963.0	971.0	8.0	5.4	68	50	112	113
163	971.0	980.0	9.0	9.2	102	92	113	114
164	980.0	987.0	7.0	7.6	109	100	114	115
165	987.0	997.0	10.0	10.1	101	86	115	115
166	997.0	1007.0	10.0	10.3	103	74	116	117
167	1007.0	1017.0	10.0	10.3	103	85	117	118
168	1017.0	1027.0	10.0	9.8	98	92	118	119
169	1027.0	1037.0	10.0	7.0	70	89	119	120
170	1037.0	1047.0	10.0	9.9	99	81	120	121
171	1047.0	1057.0	10.0	9.9	99	30	121	122
172	1057.0	1061.5	4.5	4.0	89	70	122	122
173	1061.5	1064.5	3.0	2.0	67	20	122	122
174	1064.5	1074.5	10.0	10.9	109	49	123	124
175	1074.5	1084.0	9.5	10.1	106	52	124	125
176	1084.0	1085.5	1.5	0.0	0		125	125
177	1085.5	1095.5	10.0	10.1	101	86	125	126
178	1095.5	1106.0	10.5	10.3	98	96	126	127
179	1106.0	1116.0	10.0	10.4	104	72	127	128
180	1116.0	1126.5	10.5	10.3	98	98	128	129

CORE RUN DEPTH LOG
(p. 6)

Core run #	Driller's Depth (ft) Top	Bottom	Interval	Core recovery (ft)	(%)	RQD	Core box # Top	Bottom
181	1126.5	1137.0	10.5	10.3	98	97	129	130
182	1137.0	1147.0	10.0	10.3	103	90	130	131
183	1147.0	1157.0	10.0	10.2	102	95	131	133
184	1157.0	1159.0	2.0	1.5	75	0	133	133
185	1159.0	1167.0	8.0	8.0	100	94	133	134
186	1167.0	1177.0	10.0	10.3	103	89	134	135
187	1177.0	1187.0	10.0	10.0	100	93	135	136
188	1187.0	1197.0	10.0	10.2	102	72	136	137
189	1197.0	1207.0	10.0	9.9	99	98	137	138
190	1207.0	1217.0	10.0	10.0	100	90	138	138
191	1217.0	1227.0	10.0	9.7	97	93	139	140
192	1227.0	1237.0	10.0	10.1	101	77	140	141
193	1237.0	1247.0	10.0	10.0	100	97	141	142
194	1247.0	1257.0	10.0	9.7	97	87	142	143
195	1257.0	1267.0	10.0	9.9	99	57	143	144
196	1267.0	1277.0	10.0	10.0	100	90	144	145
197	1277.0	1287.0	10.0	10.3	103	100	145	146
198	1287.0	1297.0	10.0	10.0	100	98	146	147
199	1297.0	1307.0	10.0	10.1	101	58	147	148
200	1307.0	1312.0	5.0	4.0	80	75	148	148
201	1312.0	1312.0	0.0	0.0	0		148	148
202	1312.0	1317.0	5.0	4.7	94	91	148	149
203	1317.0	1327.0	10.0	10.2	102	97	149	150
204	1327.0	1337.0	10.0	10.0	100	81	150	151
205	1337.0	1347.0	10.0	9.0	90	61	151	152
206	1347.0	1351.5	4.5	3.0	67	13	152	152
207	1351.5	1359.0	7.5	7.2	96	58	152	153
208	1359.0	1368.0	9.0	9.2	102	91	153	154
208.5	1368.0	1369.5	1.5	1.4	93	100	154	154
209	1369.5	1377.0	7.5	7.6	101	50	154	155
210	1377.0	1385.0	8.0	8.0	100	45	155	156
211	1385.0	1391.0	6.0	4.4	73	30	156	156
212	1391.0	1398.0	7.0	7.7	110	53	156	157
213	1398.0	1405.0	7.0	7.1	101	49	157	158
214	1405.0	1415.0	10.0	10.1	101	95	158	159
215	1415.0	1425.0	10.0	10.0	100	93	159	160

CORE RUN DEPTH LOG
(p. 7)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
216	1425.0	1435.0	10.0	9.6	96	95	160	161
217	1435.0	1445.0	10.0	10.1	101	84	161	161
218	1445.0	1455.0	10.0	10.1	101	89	162	163
219	1455.0	1465.0	10.0	9.9	99	95	163	164
220	1465.0	1475.0	10.0	10.3	103	72	164	166
221	1475.0	1485.0	10.0	10.2	102	82	166	167
222	1485.0	1495.0	10.0	7.9	79	19	167	168
223	1495.0	1505.0	10.0	10.3	103	85	168	169
224	1505.0	1515.0	10.0	10.3	103	84	169	170
225	1515.0	1525.0	10.0	10.2	102	95	170	171
226	1525.0	1535.0	10.0	10.3	103	55	171	172
227	1535.0	1545.0	10.0	10.6	106	94	172	173
228	1545.0	1550.0	5.0	3.9	78	100	173	173
229	1550.0	1558.0	8.0	8.2	103	85	173	174
230	1558.0	1568.0	10.0	9.7	97	77	174	175
231	1568.0	1578.0	10.0	10.3	103	90	175	176
232	1578.0	1588.0	10.0	10.0	100	58	176	177
233	1588.0	1598.0	10.0	10.2	102	17	177	178
234	1598.0	1608.0	10.0	10.0	100	75	178	180
235	1608.0	1618.0	10.0	9.6	96	81	180	180
236	1618.0	1623.0	5.0	3.8	76	34	181	181
237	1623.0	1628.5	5.5	4.6	84	9	181	181
238	1628.5	1635.0	6.5	5.7	88	49	181	182
239	1635.0	1645.0	10.0	10.3	103	100	182	183
240	1645.0	1655.0	10.0	10.2	102	60	183	184
241	1655.0	1665.0	10.0	10.0	100	62	184	185
242	1665.0	1675.0	10.0	10.2	102	58	185	187
243	1675.0	1685.0	10.0	9.8	98	70	187	188
244	1685.0	1695.0	10.0	10.0	100	94	188	189
245	1695.0	1701.0	6.0	5.6	93	23	189	189
246	1701.0	1708.0	7.0	6.8	97	85	190	190
247	1708.0	1716.0	8.0	8.0	100	45	190	191
248	1716.0	1721.0	5.0	4.5	90	22	191	192
249	1721.0	1728.0	7.0	7.2	103	94	192	192
250	1728.0	1738.0	10.0	9.5	95	68	192	193
251	1738.0	1748.0	10.0	8.8	88	85	193	194

CORE RUN DEPTH LOG
(p. 8)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
252	1748.0	1755.0	7.0	5.6	80	71	194	195
253	1755.0	1760.0	5.0	3.9	78	21	195	195
254	1760.0	1768.0	8.0	6.6	83	70	195	196
255	1768.0	1769.0	1.0	0.5	50	0	196	196
256	1769.0	1775.0	6.0	5.5	92	62	196	197
257	1775.0	1777.5	2.5	2.4	96	75	197	197
258	1777.5	1778.0	0.5	0.5	100	100	197	197
259	1778.0	1787.5	9.5	9.5	100	97	197	198
260	1787.5	1791.0	3.5	3.1	89	26	198	198
261	1791.0	1798.0	7.0	5.7	81	65	198	199
261.5	1798.0	1808.0	10.0	10.2	102	39	199	200
262	1808.0	1815.0	7.0	6.5	93	35	200	201
263	1815.0	1825.0	10.0	10.2	102	75	201	202
264	1825.0	1825.0	0.0	0.0	0		202	202
265	1825.0	1833.0	8.0	7.2	90	35	202	203
266	1833.0	1842.0	9.0	7.4	82	53	203	203
267	1842.0	1850.0	8.0	6.2	78	56	204	204
268	1850.0	1855.5	5.5	4.5	82	27	204	205
269	1855.5	1857.5	2.0	1.1	55	0	205	205
270	1857.5	1866.0	8.5	6.1	72	38	205	205
271	1866.0	1870.5	4.5	3.7	82	32	206	206
272	1870.5	1873.0	2.5	2.3	92	22	206	206
273	1873.0	1876.0	3.0	1.8	60	0	206	206
274	1876.0	1881.5	5.5	5.1	93	53	206	207
275	1881.5	1888.0	6.5	5.6	86	80	207	208
276	1888.0	1891.0	3.0	1.4	47	0	208	208
277	1891.0	1893.5	2.5	1.2	48	0	208	208
278	1893.5	1897.5	4.0	2.0	50	0	208	208
279	1897.5	1902.0	4.5	3.0	67	30	208	208
280	1902.0	1912.0	10.0	7.2	72	68	208	209
281	1912.0	1918.0	6.0	4.1	68	12	209	210
282	1918.0	1922.0	4.0	3.9	98	62	210	210
283	1922.0	1927.5	5.5	4.7	85	9	210	211
284	1927.5	1931.0	3.5	3.6	103	0	211	211
285	1931.0	1936.0	5.0	3.9	78	31	211	211
286	1936.0	1946.0	10.0	8.5	85	78	211	212

CORE RUN DEPTH LOG
(p. 9)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
287	1946.0	1956.0	10.0	8.7	87	98	212	213
288	1956.0	1964.0	8.0	7.8	98	63	213	214
289	1964.0	1971.0	7.0	6.7	96	82	214	215
290	1971.0	1981.0	10.0	9.9	99	73	215	216
291	1981.0	1991.0	10.0	10.3	103	92	216	217
292	1991.0	1997.0	6.0	4.0	67	25	217	217
293	1997.0	1999.0	2.0	2.3	115	17	218	218
294	1999.0	2007.0	8.0	7.0	88	69	218	219
295	2007.0	2010.0	3.0	1.0	33	0	219	219
296	2010.0	2014.0	4.0	2.6	65	58	219	219
297	2014.0	2019.0	5.0	5.5	110	75	219	220
298	2019.0	2027.0	8.0	6.6	83	86	220	220
299	2027.0	2029.0	2.0	1.3	65	31	220	221
300	2029.0	2033.0	4.0	1.0	25	0	221	221
301	2033.0	2036.0	3.0	1.0	33	0	221	221
302	2036.0	2042.0	6.0	6.1	102	75	221	221
303	2042.0	2052.0	10.0	10.0	100	96	221	222
304	2052.0	2062.0	10.0	10.0	100	77	223	224
305	2062.0	2071.0	9.0	7.5	83	72	224	224
306	2071.0	2080.0	9.0	7.7	86	73	224	225
307	2080.0	2088.0	8.0	5.9	74	42	225	226
308	2088.0	2095.0	7.0	4.8	69	77	226	226
309	2095.0	2105.0	10.0	9.8	98	36	226	227
310	2105.0	2115.0	10.0	10.6	106	61	227	229
311	2115.0	2125.0	10.0	10.5	105	94	229	230
312	2125.0	2135.0	10.0	9.0	90	48	230	231
313	2135.0	2145.5	10.5	10.1	96	79	231	232
314	2145.5	2156.0	10.5	10.3	98	100	232	233
315	2156.0	2166.0	10.0	10.2	102	100	233	234
316	2166.0	2176.5	10.5	10.5	100	85	234	235
317	2176.5	2187.0	10.5	10.4	99	58	235	236
318	2187.0	2195.0	8.0	7.6	95	62	237	237
319	2195.0	2205.5	10.5	10.7	102	80	237	238
320	2205.5	2210.0	4.5	3.3	73	0	239	239
321	2210.0	2220.0	10.0	9.7	97	14	239	240
322	2220.0	2230.0	10.0	10.2	102	87	240	241

CORE RUN DEPTH LOG
(p. 10)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
323	2230.0	2240.0	10.0	10.0	100	77	241	242
324	2240.0	2250.0	10.0	9.5	95	28	242	243
325	2250.0	2254.5	4.5	3.7	82	47	243	244
326	2254.5	2260.5	6.0	5.7	95	23	244	244
327	2260.5	2270.5	10.0	10.4	104	97	244	245
328	2270.5	2277.5	7.0	4.4	63	57	245	246
329	2277.5	2288.0	10.5	10.3	98	83	246	247
330	2288.0	2291.5	3.5	3.3	94	61	247	247
331	2291.5	2302.0	10.5	8.4	80	62	247	248
332	2302.0	2309.5	7.5	5.2	69	62	248	249
333	2309.5	2319.5	10.0	8.6	86	77	249	250
334	2319.5	2330.0	10.5	10.1	96	65	250	251
335	2330.0	2339.0	9.0	6.0	67	40	251	251
336	2339.0	2341.0	2.0	1.7	85	53	251	252
337	2341.0	2348.0	7.0	3.8	54	34	252	252
338	2348.0	2351.0	3.0	0.0	0		252	252
339	2351.0	2358.0	7.0	4.9	70	61	252	253
340	2358.0	2367.0	9.0	8.8	98	94	253	254
341	2367.0	2377.0	10.0	9.7	97	70	254	255
342	2377.0	2387.0	10.0	10.0	100	85	255	255
343	2387.0	2397.0	10.0	9.5	95	87	256	257
344	2397.0	2407.0	10.0	9.4	94	63	257	258
345	2407.0	2414.0	7.0	4.8	69	52	258	258
346	2414.0	2422.5	8.5	5.3	62	83	258	259
347	2422.5	2432.5	10.0	9.7	97	66	259	260
348	2432.5	2439.5	7.0	5.2	74	46	260	261
349	2439.5	2450.0	10.5	10.0	95	63	261	262
350	2450.0	2460.0	10.0	9.8	98	73	262	263
351	2460.0	2470.5	10.5	9.3	89	68	263	264
352	2470.5	2475.0	4.5	2.5	56	52	264	264
353	2475.0	2478.0	3.0	1.0	33	0	264	264
354	2478.0	2481.0	3.0	1.0	33	0	264	264
355	2481.0	2491.0	10.0	10.0	100	57	264	265
356	2491.0	2498.0	7.0	7.0	100	93	265	266
357	2498.0	2506.0	8.0	4.6	58	65	266	267
358	2506.0	2516.0	10.0	10.0	100	86	267	268

CORE RUN DEPTH LOG
(p. 11)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
359	2516.0	2526.0	10.0	10.2	102	58	268	269
360	2526.0	2536.0	10.0	7.5	75	24	269	270
361	2536.0	2544.0	8.0	2.8	35	64	270	270
362	2544.0	2552.5	8.5	6.7	79	94	270	271
363	2552.5	2561.0	8.5	2.0	24	0	271	271
364	2561.0	2563.0	2.0	1.4	70	100	271	271
365	2563.0	2573.0	10.0	10.2	102	91	271	272
366	2573.0	2583.0	10.0	8.3	83	88	272	273
367	2583.0	2591.0	8.0	4.3	54	44	273	273
368	2591.0	2601.0	10.0	9.3	93	82	274	274
369	2601.0	2611.0	10.0	5.6	56	41	275	275
370	2611.0	2621.0	10.0	4.9	49	76	275	276
371	2621.0	2631.0	10.0	10.2	102	100	276	277
372	2631.0	2638.0	7.0	1.9	27	0	277	277
373	2638.0	2647.0	9.0	7.8	87	78	277	278
374	2647.0	2657.0	10.0	9.9	99	100	278	279
375	2657.0	2667.5	10.5	9.5	90	87	279	280
376	2667.0	2678.5	11.5	9.9	86	86	280	281
377	2678.5	2687.0	8.5	7.0	82	86	281	281
378	2687.0	2691.0	4.0	2.0	50	30	282	282
379	2691.0	2701.0	10.0	10.1	101	82	282	283
380	2701.0	2710.0	9.0	6.5	72	77	283	283
381	2710.0	2716.0	6.0	4.0	67	23	283	284
382	2716.0	2726.5	10.5	10.3	98	78	284	285
383	2726.5	2731.5	5.0	2.4	48	17	285	285
384	2731.5	2736.0	4.5	1.4	31	0	285	285
385	2736.0	2746.0	10.0	10.0	100	83	285	286
386	2746.0	2756.0	10.0	10.0	100	94	286	287
387	2756.0	2763.0	7.0	6.3	90	67	288	288
388	2763.0	2766.5	3.5	3.0	86	57	288	288
389	2766.5	2771.0	4.5	2.0	44	0	289	289
390	2771.0	2780.0	9.0	6.8	76	26	289	290
391	2780.0	2789.0	9.0	0.5	6	0	290	290
392	2789.0	2793.0	4.0	1.0	25	0	290	290
393	2793.0	2799.0	6.0	4.6	77	33	290	290
394	2799.0	2807.0	8.0	6.4	80	64	290	291

CORE RUN DEPTH LOG
(p. 12)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
395	2807.0	2817.0	10.0	9.7	97	67	291	292
396	2817.0	2827.0	10.0	9.9	99	64	292	293
397	2827.0	2837.0	10.0	10.0	100	79	293	294
398	2837.0	2847.0	10.0	10.0	100	58	294	295
399	2847.0	2857.0	10.0	9.6	96	82	295	296
400	2857.0	2867.0	10.0	9.6	96	56	296	297
401	2867.0	2877.0	10.0	9.7	97	78	298	298
402	2877.0	2885.0	8.0	6.5	81	55	299	299
403	2885.0	2895.0	10.0	8.5	85	92	299	300
404	2895.0	2905.0	10.0	6.8	68	60	300	301
405	2905.0	2915.0	10.0	9.5	95	72	301	302
406	2915.0	2925.0	10.0	8.9	89	61	302	303
407	2925.0	2933.0	8.0	6.7	84	25	303	304
408	2933.0	2943.5	10.5	10.1	96	60	304	305
409	2943.5	2954.0	10.5	9.2	88	39	305	306
410	2954.0	2965.0	11.0	2.2	20	18	306	306
411	2965.0	2975.0	10.0	8.7	87	95	306	307
412	2975.0	2985.0	10.0	8.1	81	65	307	308
413	2985.0	2995.0	10.0	7.3	73	89	308	308
416	2995.0	3001.0	6.0	0.6	10	0	308	308
417	3001.0	3011.0	10.0	10.2	102	86	308	310
418	3011.0	3021.0	10.0	10.3	103	96	310	311
419	3021.0	3031.0	10.0	10.1	101	96	311	312
420	3031.0	3041.5	10.5	10.0	95	45	312	313
421	3041.5	3051.5	10.0	10.1	101	91	313	314
422	3051.5	3062.0	10.5	10.3	98	76	314	315
423	3062.0	3072.0	10.0	9.9	99	87	315	316
424	3072.0	3082.0	10.0	10.1	101	73	316	317
425	3082.0	3089.0	7.0	7.4	106	68	317	318
426	3089.0	3099.0	10.0	2.6	26	15	318	318
427	3099.0	3102.0	3.0	2.2	73	41	318	318
428	3102.0	3112.0	10.0	7.7	77	61	318	319
429	3112.0	3119.0	7.0	2.7	39	30	319	320
430	3119.0	3129.0	10.0	6.0	60	37	320	320
431	3129.0	3139.0	10.0	9.7	97	71	320	321
432	3139.0	3148.0	9.0	6.0	67	73	321	322

CORE RUN DEPTH LOG
(p. 13)

Core run #	Driller's Depth (ft)			Core recovery		RQD	Core box #	
	Top	Bottom	Interval	(ft)	(%)		Top	Bottom
433	3148.0	3158.0	10.0	10.1	101	8	322	323
434	3158.0	3169.0	11.0	9.9	90	57	323	334
435	3169.0	3179.0	10.0	10.1	101	51	324	325
436	3179.0	3189.0	10.0	10.3	103	62	325	326
437	3189.0	3197.0	8.0	6.4	80	55	326	327
438	3197.0	3207.0	10.0	7.7	77	57	327	328
439	3207.0	3211.0	4.0	2.7	68	41	328	328
440	3211.0	3219.0	8.0	5.5	69	58	328	329
441	3219.0	3226.0	7.0	4.7	67	66	329	329
442	3226.0	3237.0	11.0	8.8	80	82	329	330
443	3237.0	3241.5	4.5	2.5	56	44	330	330
444	3241.5	3251.5	10.0	9.9	99	66	331	332
445	3251.5	3261.0	9.5	8.2	86	68	332	332
446	3261.0	3271.0	10.0	10.1	101	81	333	334
447	3271.0	3278.0	7.0	6.9	99	70	334	334
448	3278.0	3286.0	8.0	6.9	86	45	334	335
449	3286.0	3293.0	7.0	6.0	86	38	335	336
450	3293.0	3298.0	5.0	3.7	74	22	336	336
451	3298.0	3308.0	10.0	10.4	104	60	336	337
452	3308.0	3316.0	8.0	7.3	91	89	337	338
452.5	3316.0	3326.0	10.0	10.2	102	83	338	339
453	3326.0	3334.0	8.0	5.0	63	50	339	340
454	3334.0	3336.0	2.0	2.4	120	0	340	340
455	3336.0	3346.0	10.0	10.5	105	70	340	341
456	3346.0	3356.0	10.0	10.2	102	77	341	342
457	3356.0	3366.0	10.0	10.2	102	69	343	344
458	3366.0	3376.0	10.0	10.3	103	85	344	345
459	3376.0	3386.5	10.5	10.4	99	85	345	346
460	3386.5	3397.0	10.5	9.0	86	72	346	347
461	3397.0	3407.0	10.0	10.7	107	58	347	348
462	3407.0	3417.0	10.0	10.2	102	82	348`	349
463	3417.0	3427.0	10.0	10.2	102	72	349	350
464	3427.0	3437.0	10.0	9.5	95	69	350	351
465	3437.0	3447.0	10.0	10.0	100	69	351	352
466	3447.0	3457.0	10.0	9.5	95	95	352	353
467	3457.0	3464.0	7.0	5.9	84	53	353	354

Revised Depths for Top of Core Run
(p. 1)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
1	26.0	30.0	5.3	**26.0**	
2	30.0	32.0	3.9	**30.0**	no
3	32.0	37.0	5.1	**32.1**	ambiguous
4	37.0	42.0	5.2	**37.2**	yes
5	42.0	47.0	6.0	**42.4**	yes
6	47.0	52.0	1.1	**48.4**	no
7	52.0	57.0	0.0	**52.0**	
8	57.0	61.0	2.4	**57.0**	no
9	61.0	62.5	0.8	**61.0**	no
10	62.5	65.0	1.7	**62.5**	no
11	65.0	70.0	3.9	**65.0**	no
12	70.0	72.0	1.4	**70.0**	no
13	72.0	72.5	1.2	**71.4**	no
14	72.5	77.5	3.2	**72.6**	no
15	77.5	82.0	2.3	**77.5**	no
16	82.0	84.0	1.4	**82.0**	no
17	84.0	87.0	0.7	**84.0**	no
18	87.0	88.5	2.4	**84.7**	no
19	89.0	92.0	5.7	**87.1**	no
20	92.0	92.5	1.7	**92.8**	no
21	92.5	95.5	3.8	**94.5**	no
22	95.5	100.0	3.3	**98.3**	no
23	95.5	100.0	0.0	**101.6**	
24	100.0	100.0	0.0	**101.6**	
25	100.0	104.0	3.9	**101.6**	no
26	104.0	106.5	2.0	**105.5**	no
27	106.5	110.5	1.5	**107.5**	no
28	110.5	114.0	3.4	**110.5**	no
29	114.0	119.0	4.3	**114.0**	no
30	119.0	122.0	0.0	**119.0**	
31	122.0	132.0	5.5	**122.0**	no
32	132.0	142.0	5.4	**132.0**	no
33	142.0	152.0	3.3	**142.0**	no
34	152.0	162.0	2.0	**152.0**	ambiguous
35	162.0	164.0	3.8	**162.0**	ambiguous
36	167.0	172.0	4.1	**167.0**	ambiguous
37	172.0	176.0	4.2	**172.0**	ambiguous
38	176.0	181.0	4.0	**176.2**	no
39	181.0	185.0	2.5	**180.2**	no
40	185.0	192.0	4.6	**185.0**	

Revised Depths for Top of Core Run (p. 2)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's footage for top of run (ft)	Core Continuity
41	192.0	196.5	3.8	**192.0**	no
42	196.5	199.5	2.7	**196.5**	no
43	199.5	203.5	2.9	**199.2**	yes
44	203.5	206.5	2.6	**203.5**	no
45	206.5	207.0	0.8	**206.5**	no
46	207.0	210.5	3.8	**207.3**	yes
47	210.5	214.0	3.0	**211.1**	no
48	214.0	214.0	0.5	**214.1**	yes
49	214.0	217.0	2.5	**214.6**	yes
50	217.0	222.0	4.9	**217.1**	yes
51	222.0	227.0	5.2	**222.0**	yes
52	227.0	231.5	3.8	**227.2**	yes
53	231.5	236.5	5.2	**231.5**	no
54	236.5	241.5	5.3	**236.7**	no
55	241.5	247.0	5.4	**242.0**	ambiguous
56	247.0	252.0	5.0	**247.4**	no
57	252.0	257.0	5.1	**252.4**	yes
58	257.0	262.0	5.0	**257.5**	yes
59	262.0	267.0	5.2	**262.5**	yes
60	267.0	272.0	4.9	**267.7**	yes
61	272.0	277.0	5.3	**272.6**	yes
62	277.0	282.0	4.8	**277.9**	yes
63	282.0	287.0	5.3	**282.7**	yes
64	287.0	292.0	4.8	**288.0**	yes
65	292.0	297.0	5.2	**292.8**	yes
66	297.0	302.0	4.5	**298.0**	ambiguous
67	302.0	307.0	5.0	**302.5**	ambiguous
68	307.0	312.0	5.0	**307.5**	yes
69	312.0	317.0	4.4	**312.5**	yes
70	317.0	322.0	4.8	**316.9**	yes
71	322.0	327.0	5.2	**321.7**	yes
72	327.0	332.0	5.2	**327.0**	no
73	332.0	337.0	5.1	**332.2**	yes
74	337.0	342.0	4.9	**337.3**	yes
75	342.0	347.0	4.9	**342.2**	yes
76	347.0	352.0	5.2	**347.1**	yes
77	352.0	357.0	5.2	**352.3**	yes
78	357.0	362.0	5.1	**357.5**	ambiguous
79	362.0	367.0	4.5	**362.6**	no
80	367.0	372.0	4.9	**367.1**	yes

Revised Depths for Top of Core Run (p. 3)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
81	372.0	377.0	5.0	**372.0**	yes
82	377.0	382.0	5.0	**377.0**	yes
83	382.0	387.0	5.2	**382.0**	yes
84	387.0	392.0	5.1	**387.2**	yes
85	392.0	397.0	5.3	**392.3**	yes
86	397.0	402.0	5.2	**397.6**	yes
87	402.0	407.0	5.2	**402.8**	no
88	407.0	412.0	4.6	**408.0**	yes
89	412.0	417.0	4.2	**412.6**	yes
90	417.0	422.0	4.5	**417.0**	ambiguous
91	422.0	427.0	5.2	**421.5**	yes
92	427.0	432.0	4.5	**426.7**	yes
93	432.0	437.0	5.0	**432.0**	ambiguous
94	437.0	442.0	4.4	**437.0**	no
95	442.0	447.0	5.3	**441.4**	yes
96	447.0	452.0	4.9	**446.7**	yes
97	452.0	457.0	5.3	**451.6**	yes
98	457.0	462.0	4.4	**456.9**	yes
99	462.0	467.0	5.1	**462.0**	ambiguous
100	467.0	472.0	4.9	**467.1**	yes
101	472.0	477.0	5.1	**472.0**	yes
102	477.0	482.0	4.9	**477.1**	yes
103	482.0	487.0	5.2	**482.0**	yes
104	487.0	492.0	5.1	**487.2**	yes
105	492.0	497.0	5.3	**492.3**	yes
106	497.0	502.0	4.4	**497.6**	no
107	502.0	507.0	5.2	**502.0**	yes
108	507.0	517.0	10.0	**507.2**	yes
109	517.0	527.0	10.0	**517.2**	yes
110	527.0	537.0	9.7	**527.2**	yes
111	537.0	547.0	10.5	**537.0**	no
112	547.0	557.0	6.0	**547.5**	yes
113	564.0	574.0	10.3	**564.0**	no
114	574.0	584.0	9.7	**574.3**	no
115	584.0	594.0	9.7	**584.0**	yes
116	594.0	604.0	10.2	**594.0**	ambiguous
117	604.0	609.0	5.2	**604.2**	ambiguous
118	609.0	612.0	3.1	**609.4**	no
119	612.0	617.0	1.8	**612.5**	no
120	617.0	626.0	9.7	**617.0**	yes

Revised Depths for Top of Core Run (p. 4)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
121	626.0	632.0	6.8	**626.7**	no
122	632.0	639.0	5.3	**633.5**	yes
123	639.0	640.5	1.8	**639.0**	no
124	640.5	647.0	3.6	**640.8**	no
125	647.0	657.0	10.1	**644.4**	yes
126	657.0	667.0	9.9	**654.5**	yes
127	667.0	677.0	10.0	**664.4**	yes
128	677.0	686.0	8.6	**674.4**	yes
129	686.0	696.5	10.0	**686.0**	no
130	696.5	707.0	10.5	**696.0**	yes
131	707.0	717.0	9.0	**707.0**	no
132	717.0	727.0	10.0	**716.0**	yes
133	727.0	737.0	10.2	**726.0**	yes
134	737.0	747.0	9.4	**736.2**	yes
135	747.0	757.0	9.5	**747.0**	no
136	757.0	767.0	2.6	**757.0**	no
137	767.0	772.0	0.5	**767.0**	no
138	772.0	777.0	0.1	**772.0**	no
139	777.0	784.0	0.5	**777.0**	no
140	784.0	789.0	3.2	**784.0**	no
141	789.0	789.5	0.0	**789.0**	
142	789.5	799.0	9.5	**789.5**	no
143	799.0	807.0	6.5	**799.0**	yes
144	807.0	809.0	0.8	**807.0**	no
145	809.0	817.0	8.5	**809.0**	no
146	817.0	825.5	8.4	**817.5**	yes
147	825.5	835.5	0.0	**825.9**	
148	835.5	846.0	3.9	**835.5**	no
149	847.0	853.0	4.3	**847.0**	no
150	853.0	863.0	6.6	**853.0**	no
151	863.0	873.0	10.2	**859.6**	yes
152	873.0	880.5	7.0	**869.8**	yes
153	880.5	887.5	7.2	**876.8**	yes
154	887.5	897.0	9.6	**884.0**	yes
155	897.0	907.0	10.1	**893.6**	yes
156	907.0	917.0	4.9	**903.7**	yes
157	917.0	927.0	5.8	**917.0**	no
158	927.0	937.0	9.8	**922.8**	yes
159	937.0	947.0	9.9	**932.6**	yes
160	947.0	957.0	9.8	**942.5**	yes

Revised Depths for Top of Core Run
(p. 5)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
161	957.0	963.0	4.5	**957.0**	no
162	963.0	971.0	5.4	**963.0**	no
163	971.0	980.0	9.2	**971.0**	no
164	980.0	987.0	7.6	**980.2**	yes
165	987.0	997.0	10.1	**987.8**	yes
166	997.0	1007.0	10.3	**997.9**	ambiguous
167	1007.0	1017.0	10.3	**1008.2**	yes
168	1017.0	1027.0	9.8	**1018.5**	no
169	1027.0	1037.0	7.0	**1028.3**	no
170	1037.0	1047.0	9.9	**1035.3**	yes
171	1047.0	1057.0	9.9	**1047.0**	no
172	1057.0	1061.5	4.0	**1057.0**	no
173	1061.5	1064.5	2.0	**1061.5**	no
174	1064.5	1074.5	10.9	**1064.5**	no
175	1074.5	1084.0	10.1	**1075.4**	yes
176	1084.0	1085.5	0.0	**1085.5**	
177	1085.5	1095.5	10.1	**1085.5**	no
178	1095.5	1106.0	10.3	**1095.6**	yes
179	1106.0	1116.0	10.4	**1105.9**	yes
180	1116.0	1126.5	10.3	**1116.3**	no
181	1126.5	1137.0	10.3	**1126.6**	yes
182	1137.0	1147.0	10.3	**1136.9**	yes
183	1147.0	1157.0	10.2	**1147.2**	yes
184	1157.0	1159.0	1.5	**1157.4**	no
185	1159.0	1167.0	8.0	**1159.0**	no
186	1167.0	1177.0	10.3	**1167.0**	yes
187	1177.0	1187.0	10.0	**1177.3**	yes
188	1187.0	1197.0	10.2	**1187.3**	no
189	1197.0	1207.0	9.9	**1197.5**	no
190	1207.0	1217.0	10.0	**1207.4**	yes
191	1217.0	1227.0	9.7	**1217.4**	yes
192	1227.0	1237.0	10.1	**1227.1**	yes
193	1237.0	1247.0	10.0	**1237.2**	yes
194	1247.0	1257.0	9.7	**1247.2**	no
195	1257.0	1267.0	9.9	**1257.0**	no
196	1267.0	1277.0	10.0	**1266.9**	yes
197	1277.0	1287.0	10.3	**1276.9**	yes
198	1287.0	1297.0	10.0	**1287.2**	yes
199	1297.0	1307.0	10.1	**1297.2**	no
200	1307.0	1312.0	4.0	**1307.3**	yes

Revised Depths for Top of Core Run (p. 6)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's footage for top of run (ft)	Core Continuity
201	1312.0	1312.0	0.0	**1312.0**	
202	1312.0	1317.0	4.7	**1312.0**	no
203	1317.0	1327.0	10.2	**1317.0**	no
204	1327.0	1337.0	10.0	**1327.2**	yes
205	1337.0	1347.0	9.0	**1337.2**	no
206	1347.0	1351.5	3.0	**1347.0**	no
207	1351.5	1359.0	7.2	**1351.5**	no
208	1359.0	1368.0	9.2	**1358.7**	yes
208.5	1368.0	1369.5	1.4	**1367.9**	yes
209	1369.5	1377.0	7.6	**1369.3**	yes
210	1377.0	1385.0	8.0	**1377.0**	no
211	1385.0	1391.0	4.4	**1385.0**	no
212	1391.0	1398.0	7.7	**1391.0**	no
213	1398.0	1405.0	7.1	**1398.7**	yes
214	1405.0	1415.0	10.1	**1405.8**	yes
215	1415.0	1425.0	10.0	**1415.9**	ambiguous
216	1425.0	1435.0	9.6	**1425.9**	yes
217	1435.0	1445.0	10.1	**1435.5**	ambiguous
218	1445.0	1455.0	10.1	**1445.6**	no
219	1455.0	1465.0	9.9	**1455.7**	ambiguous
220	1465.0	1475.0	10.3	**1465.6**	no
221	1475.0	1485.0	10.2	**1475.9**	yes
222	1485.0	1495.0	7.9	**1486.1**	no
223	1495.0	1505.0	10.3	**1495.0**	no
224	1505.0	1515.0	10.3	**1505.3**	yes
225	1515.0	1525.0	10.2	**1515.6**	no
226	1525.0	1535.0	10.3	**1525.8**	yes
227	1535.0	1545.0	10.6	**1536.1**	no
228	1545.0	1550.0	3.9	**1546.7**	yes
229	1550.0	1558.0	8.2	**1550.6**	yes
230	1558.0	1568.0	9.7	**1558.8**	yes
231	1568.0	1578.0	10.3	**1568.5**	no
232	1578.0	1588.0	10.0	**1578.8**	yes
233	1588.0	1598.0	10.2	**1588.8**	yes
234	1598.0	1608.0	10.0	**1599.0**	no
235	1608.0	1618.0	9.6	**1609.0**	yes
236	1618.0	1623.0	3.8	**1618.6**	no
237	1623.0	1628.5	4.6	**1623.0**	no
238	1628.5	1635.0	5.7	**1628.5**	no
239	1635.0	1645.0	10.3	**1635.0**	no

Revised Depths for Top of Core Run
(p. 7)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
240	1645.0	1655.0	10.2	**1645.3**	yes
241	1655.0	1665.0	10.0	**1655.5**	yes
242	1665.0	1675.0	10.2	**1665.5**	no
243	1675.0	1685.0	9.8	**1675.7**	no
244	1685.0	1695.0	10.0	**1685.5**	yes
245	1695.0	1701.0	5.6	**1695.5**	yes
246	1701.0	1708.0	6.8	**1701.1**	no
247	1708.0	1716.0	8.0	**1707.9**	yes
248	1716.0	1721.0	4.5	**1716.0**	no
249	1721.0	1728.0	7.2	**1720.5**	yes
250	1728.0	1738.0	9.5	**1727.7**	yes
251	1738.0	1748.0	8.8	**1738.0**	no
252	1748.0	1755.0	5.6	**1746.8**	yes
253	1755.0	1760.0	3.9	**1755.0**	no
254	1760.0	1768.0	6.6	**1760.0**	no
255	1768.0	1769.0	0.5	**1768.0**	no
256	1769.0	1775.0	5.5	**1769.0**	no
257	1775.0	1777.5	2.4	**1775.0**	no
258	1777.5	1778.0	0.5	**1777.4**	yes
259	1778.0	1787.5	9.5	**1778.1**	no
260	1787.5	1791.0	3.1	**1787.6**	yes
261	1791.0	1798.0	5.7	**1791.0**	no
261.5	1798.0	1808.0	10.2	**1796.7**	yes
262	1808.0	1815.0	6.5	**1808.0**	no
263	1815.0	1825.0	10.2	**1815.0**	no
264	1825.0	1825.0	0.0	**1825.2**	
265	1825.0	1833.0	7.2	**1825.2**	no
266	1833.0	1842.0	7.4	**1833.0**	no
267	1842.0	1850.0	6.2	**1842.0**	no
268	1850.0	1855.5	4.5	**1850.0**	no
269	1855.5	1857.5	1.1	**1855.5**	no
270	1857.5	1866.0	6.1	**1857.5**	no
271	1866.0	1870.5	3.7	**1866.0**	no
272	1870.5	1873.0	2.3	**1870.5**	no
273	1873.0	1876.0	1.8	**1873.0**	no
274	1876.0	1881.5	5.1	**1876.0**	no
275	1881.5	1888.0	5.6	**1881.1**	yes
276	1888.0	1891.0	1.4	**1888.0**	no
277	1891.0	1893.5	1.2	**1891.0**	no
278	1893.5	1897.5	2.0	**1893.5**	no

Revised Depths for Top of Core Run (p. 8)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
279	1897.5	1902.0	3.0	**1897.5**	no
280	1902.0	1912.0	7.2	**1902.0**	no
281	1912.0	1918.0	4.1	**1909.2**	yes
282	1918.0	1922.0	3.9	**1918.0**	no
283	1922.0	1927.5	4.7	**1922.0**	no
284	1927.5	1931.0	3.6	**1927.5**	no
285	1931.0	1936.0	3.9	**1931.1**	no
286	1936.0	1946.0	8.5	**1935.0**	yes
287	1946.0	1956.0	8.7	**1946.0**	no
288	1956.0	1964.0	7.8	**1954.7**	yes
289	1964.0	1971.0	6.7	**1962.5**	yes
290	1971.0	1981.0	9.9	**1971.0**	no
291	1981.0	1991.0	10.3	**1980.9**	yes
292	1991.0	1997.0	4.0	**1991.2**	no
293	1997.0	1999.0	2.3	**1997.0**	no
294	1999.0	2007.0	7.0	**1999.3**	no
295	2007.0	2010.0	1.0	**2007.0**	no
296	2010.0	2014.0	2.6	**2010.0**	no
297	2014.0	2019.0	5.5	**2014.0**	no
298	2019.0	2027.0	6.6	**2019.5**	yes
299	2027.0	2029.0	1.3	**2027.0**	no
300	2029.0	2033.0	1.0	**2029.0**	no
301	2033.0	2036.0	1.0	**2033.0**	no
302	2036.0	2042.0	6.1	**2036.0**	no
303	2042.0	2052.0	10.0	**2042.1**	yes
304	2052.0	2062.0	10.0	**2052.1**	yes
305	2062.0	2071.0	7.5	**2062.1**	yes
306	2071.0	2080.0	7.7	**2071.0**	no
307	2080.0	2088.0	5.9	**2080.0**	no
308	2088.0	2095.0	4.8	**2085.9**	yes
309	2095.0	2105.0	9.8	**2095.0**	no
310	2105.0	2115.0	10.6	**2105.0**	no
311	2115.0	2125.0	10.5	**2115.6**	yes
312	2125.0	2135.0	9.0	**2126.1**	yes
313	2135.0	2145.5	10.1	**2135.1**	no
314	2145.5	2156.0	10.3	**2145.2**	yes
315	2156.0	2166.0	10.2	**2156.0**	ambiguous
316	2166.0	2176.5	10.5	**2166.2**	yes
317	2176.5	2187.0	10.4	**2176.7**	yes
318	2187.0	2195.0	7.6	**2187.1**	yes

Revised Depths for Top of Core Run
(p. 9)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
319	2195.0	2205.5	10.7	**2195.0**	no
320	2205.5	2210.0	3.3	**2205.7**	no
321	2210.0	2220.0	9.7	**2210.0**	no
322	2220.0	2230.0	10.2	**2219.7**	yes
323	2230.0	2240.0	10.0	**2229.9**	yes
324	2240.0	2250.0	9.5	**2240.0**	no
325	2250.0	2254.5	3.7	**2250.0**	no
326	2254.5	2260.5	5.7	**2254.5**	no
327	2260.5	2270.5	10.4	**2260.2**	yes
328	2270.5	2277.5	4.4	**2270.6**	yes
329	2277.5	2288.0	10.3	**2277.5**	no
330	2288.0	2291.5	3.3	**2287.8**	yes
331	2291.5	2302.0	8.4	**2291.5**	no
332	2302.0	2309.5	5.2	**2302.0**	no
333	2309.5	2319.5	8.6	**2309.5**	no
334	2319.5	2330.0	10.1	**2319.5**	no
335	2330.0	2339.0	6.0	**2329.6**	yes
336	2339.0	2341.0	1.7	**2339.0**	no
337	2341.0	2348.0	3.8	**2341.0**	no
338	2348.0	2351.0	0.0	**2348.0**	
339	2351.0	2358.0	4.9	**2351.0**	no
340	2358.0	2367.0	8.8	**2358.0**	no
341	2367.0	2377.0	9.7	**2366.8**	yes
342	2377.0	2387.0	10.0	**2376.5**	yes
343	2387.0	2397.0	9.5	**2386.5**	yes
344	2397.0	2407.0	9.4	**2397.0**	ambiguous
345	2407.0	2414.0	4.8	**2407.0**	no
346	2414.0	2422.5	5.3	**2411.8**	yes
347	2422.5	2432.5	9.7	**2417.1**	yes
348	2432.5	2439.5	5.2	**2432.5**	ambiguous
349	2439.5	2450.0	10.0	**2439.5**	no
350	2450.0	2460.0	9.8	**2449.5**	yes
351	2460.0	2470.5	9.3	**2460.0**	no
352	2470.5	2475.0	2.5	**2469.3**	yes
353	2475.0	2478.0	1.0	**2475.0**	no
354	2478.0	2481.0	1.0	**2478.0**	
355	2481.0	2491.0	10.0	**2481.0**	no
356	2491.0	2498.0	7.0	**2491.0**	yes
357	2498.0	2506.0	4.6	**2498.0**	ambiguous
358	2506.0	2516.0	10.0	**2506.0**	ambiguous

Revised Depths for Top of Core Run (p. 10)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's footage for top of run (ft)	Core Continuity
359	2516.0	2526.0	10.2	**2516.0**	yes
360	2526.0	2536.0	7.5	**2526.2**	no
361	2536.0	2544.0	2.8	**2536.0**	no
362	2544.0	2552.5	6.7	**2544.0**	no
363	2552.5	2561.0	2.0	**2550.7**	yes
364	2561.0	2563.0	1.4	**2561.0**	no
365	2563.0	2573.0	10.2	**2563.0**	no
366	2573.0	2583.0	8.3	**2573.2**	yes
367	2583.0	2591.0	4.3	**2583.0**	no
368	2591.0	2601.0	9.3	**2591.0**	no
369	2601.0	2611.0	5.6	**2601.0**	no
370	2611.0	2621.0	4.9	**2611.0**	no
371	2621.0	2631.0	10.2	**2615.9**	yes
372	2631.0	2638.0	1.9	**2631.0**	no
373	2638.0	2647.0	7.8	**2638.0**	no
374	2647.0	2657.0	9.9	**2645.8**	yes
375	2657.0	2667.5	9.5	**2655.7**	yes
376	2667.0	2678.5	9.9	**2667.0**	no
377	2678.5	2687.0	7.0	**2676.9**	yes
378	2687.0	2691.0	2.0	**2687.0**	no
379	2691.0	2701.0	10.1	**2691.0**	no
380	2701.0	2710.0	6.5	**2701.1**	yes
381	2710.0	2716.0	4.0	**2710.0**	no
382	2716.0	2726.5	10.3	**2716.0**	no
383	2726.5	2731.5	2.4	**2726.3**	yes
384	2731.5	2736.0	1.4	**2731.5**	
385	2736.0	2746.0	10.0	**2736.0**	no
386	2746.0	2756.0	10.0	**2746.0**	yes
387	2756.0	2763.0	6.3	**2756.0**	yes
388	2763.0	2766.5	3.0	**2762.3**	yes
389	2766.5	2771.0	2.0	**2766.5**	no
390	2771.0	2780.0	6.8	**2771.0**	no
391	2780.0	2789.0	0.5	**2780.0**	no
392	2789.0	2793.0	1.0	**2789.0**	no
393	2793.0	2799.0	4.6	**2793.0**	no
394	2799.0	2807.0	6.4	**2799.0**	no
395	2807.0	2817.0	9.7	**2807.0**	no
396	2817.0	2827.0	9.9	**2817.0**	no
397	2827.0	2837.0	10.0	**2827.0**	ambiguous
398	2837.0	2847.0	10.0	**2837.0**	yes

Revised Depths for Top of Core Run
(p. 11)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
399	2847.0	2857.0	9.6	**2847.0**	yes
400	2857.0	2867.0	9.6	**2857.0**	no
401	2867.0	2877.0	9.7	**2867.0**	no
402	2877.0	2885.0	6.5	**2877.0**	no
403	2885.0	2895.0	8.5	**2885.0**	no
404	2895.0	2905.0	6.8	**2893.5**	yes
405	2905.0	2915.0	9.5	**2905.0**	no
406	2915.0	2925.0	8.9	**2914.5**	yes
407	2925.0	2933.0	6.7	**2923.5**	yes
408	2933.0	2943.5	10.1	**2933.0**	no
409	2943.5	2954.0	9.2	**2943.1**	yes
410	2954.0	2965.0	2.2	**2954.0**	no
411	2965.0	2975.0	8.7	**2965.0**	no
412	2975.0	2985.0	8.1	**2975.0**	no
413	2985.0	2995.0	7.3	**2985.0**	no
416	2995.0	3001.0	0.6	**2995.0**	no
417	3001.0	3011.0	10.2	**3001.0**	no
418	3011.0	3021.0	10.3	**3011.2**	yes
419	3021.0	3031.0	10.1	**3021.5**	yes
420	3031.0	3041.5	10.0	**3031.6**	no
421	3041.5	3051.5	10.1	**3041.6**	yes
422	3051.5	3062.0	10.3	**3051.7**	yes
423	3062.0	3072.0	9.9	**3062.0**	no
424	3072.0	3082.0	10.1	**3071.9**	yes
425	3082.0	3089.0	7.4	**3082.0**	yes
426	3089.0	3099.0	2.6	**3089.4**	no
427	3099.0	3102.0	2.2	**3099.0**	no
428	3102.0	3112.0	7.7	**3102.0**	no
429	3112.0	3119.0	2.7	**3112.0**	no
430	3119.0	3129.0	6.0	**3119.0**	no
431	3129.0	3139.0	9.7	**3129.0**	no
432	3139.0	3148.0	6.0	**3138.7**	yes
433	3148.0	3158.0	10.1	**3148.8**	no
434	3158.0	3169.0	9.9	**3158.9**	yes
435	3169.0	3179.0	10.1	**3169.0**	no
436	3179.0	3189.0	10.3	**3179.1**	no
437	3189.0	3197.0	6.4	**3189.4**	yes
438	3197.0	3207.0	7.7	**3197.0**	no
439	3207.0	3211.0	2.7	**3207.0**	no
440	3211.0	3219.0	5.5	**3211.0**	no

Revised Depths for Top of Core Run (p. 12)

Core run #	Driller's depth top (ft)	Driller's depth bottom (ft)	Revised Core Recov (ft)	Revised Driller's Est. footage for top of run (ft)	Core Continuity
441	3219.0	3226.0	4.7	**3219.0**	no
442	3226.0	3237.0	8.8	**3226.0**	no
443	3237.0	3241.5	2.5	**3234.8**	yes
444	3241.5	3251.5	9.9	**3241.5**	no
445	3251.5	3261.0	8.2	**3251.5**	no
446	3261.0	3271.0	10.1	**3261.0**	no
447	3271.0	3278.0	6.9	**3271.1**	
448	3278.0	3286.0	6.9	**3278.0**	yes
449	3286.0	3293.0	6.0	**3286.0**	no
450	3293.0	3298.0	3.7	**3293.0**	no
451	3298.0	3308.0	10.4	**3296.7**	yes
452	3308.0	3316.0	7.3	**3308.0**	no
452.5	3316.0	3326.0	10.2	**3316.0**	no
453	3326.0	3334.0	5.0	**3326.2**	no
454	3334.0	3336.0	2.4	**3334.0**	no
455	3336.0	3346.0	10.5	**3336.4**	no
456	3346.0	3356.0	10.2	**3347.1**	yes
457	3356.0	3366.0	10.2	**3357.3**	no
458	3366.0	3376.0	10.3	**3367.5**	no
459	3376.0	3386.5	10.4	**3377.9**	yes
460	3386.5	3397.0	9.0	**3388.3**	no
461	3397.0	3407.0	10.7	**3397.3**	no
462	3407.0	3417.0	10.2	**3408.0**	no
463	3417.0	3427.0	10.2	**3418.2**	no
464	3427.0	3437.0	9.5	**3428.4**	yes
465	3437.0	3447.0	10.0	**3437.9**	no
466	3447.0	3457.0	9.5	**3447.9**	yes
467	3457.0	3464.0	5.9	**3457.4**	yes

CORE BOX RECORD FORM
(p. 1)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
1	26.0	29.6	3.6	1					
2	29.6	32.2	2.6	1	2				
3	32.2	33.9	1.7	2	3				
4	33.9	37.1	3.2	3					
5	37.0	40.5	3.5	4					
6	40.5	44.0	3.5	4	5				
7	44.0	47.0	3.0	5					
8	47.0	58.3	11.3	5	6	7	8		
9	58.3	65.5	7.2	8	9	10	11		
10	65.5	70.4	4.9	11	12				
11	70.4	74.3	3.9	12	13	14			
12	74.3	82.3	8.0	14	15	16			
13	82.3	89.6	7.3	16	17	18	19		
14	89.6	91.3	1.7	19					
15	91.3	92.8	1.5	19	20	21			
16	92.8	97.7	4.9	21	22				
17	97.7	100.5	2.8	22	23	24	25		
18	100.5	104.0	3.5	25					
19	104.0	106.5	2.5	26	27				
20	106.5	111.6	5.1	27	28				
21	111.6	116.1	4.5	28	29				
22	116.1	127.2	11.1	29	30	31			
23	127.2	131.2	4.0	31					
24	131.2	139.5	8.3	31	32				
25	139.5	150.0	10.5	32	33				
26	150.0	162.0	12.0	33	34				
27	162.0	167.0	5.0	35					
28	167.0	172.0	5.0	36					
29	172.0	175.8	3.8	37					
30	175.8	180.7	4.9	37	38				
31	180.7	187.9	7.2	38	39	40			
32	187.9	192.0	4.1	40					
33	192.0	195.2	3.2	41					
34	195.2	198.9	3.7	41	42				
35	198.9	203.3	4.4	42	43				
36	203.3	206.6	3.3	43	44	45			

CORE BOX RECORD FORM
(p. 2)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
37	206.6	210.0	3.4	45	46				
38	210.0	213.0	3.0	46	47				
39	213.0	214.4	1.4	47	48				
40	214.4	223.4	9.0	49	50	51			
41	223.4	232.9	9.5	51	52	53			
42	232.9	241.6	8.7	53	54	55			
43	241.6	250.8	9.2	55	56				
44	250.8	259.7	8.9	56	57	58			
45	259.7	268.3	8.6	58	59	60			
46	268.3	277.0	8.7	60	61				
47	277.0	285.6	8.6	62	63				
48	285.6	294.7	9.1	63	64	65			
49	294.7	304.0	9.3	65	66	67			
50	304.0	314.1	10.1	67	68	69			
51	314.1	323.7	9.6	69	70	71			
52	323.7	332.0	8.3	71	72				
53	332.0	341.3	9.3	73	74				
54	341.3	350.2	8.9	74	75	76			
55	350.2	359.0	8.8	76	77	78			
56	359.0	368.4	9.4	78	79	80			
57	368.4	377.6	9.2	80	81	82			
58	377.6	386.8	9.2	82	83				
59	386.8	395.6	8.8	83	84	85			
60	395.6	404.5	8.9	85	86	87			
61	404.5	414.7	10.2	87	88	89			
62	414.7	423.9	9.2	89	90	91			
63	423.9	432.7	8.8	91	92	93			
64	432.7	442.0	9.3	93	94				
65	442.0	451.5	9.5	95	96				
66	451.5	461.4	9.9	96	97	98			
67	461.4	470.9	9.5	98	99	100			
68	470.9	480.5	9.6	100	101	102			
69	480.5	489.6	9.1	102	103	104			
70	489.6	499.6	10.0	104	105	106			
71	499.6	508.9	9.3	106	107	108			
72	508.9	518.3	9.4	108	109				

CORE BOX RECORD FORM
(p. 3)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
73	518.3	527.8	9.5	109	110				
74	527.8	536.8	9.0	110	111				
75	536.8	545.7	8.9	111					
76	545.7	565.6	19.9	111	112	113			
77	565.6	574.0	8.4	113					
78	574.0	583.6	9.6	114					
79	583.6	593.0	9.4	114	115				
80	593.0	602.4	9.4	115	116				
81	602.4	611.0	8.6	116	117	118			
82	611.0	622.1	11.1	118	119	120			
83	622.1	630.1	8.0	120	121				
84	630.1	639.7	9.6	122					
85	639.7	652.0	12.3	123	124				
86	652.0	661.9	9.9	125	126				
87	661.9	671.8	9.9	126	127				
88	671.8	681.8	10.0	127	128				
89	681.8	690.7	8.9	128	129				
90	690.7	700.3	9.6	129	130				
91	700.3	710.4	10.1	130	131				
92	710.4	720.0	9.6	131	132				
93	720.0	729.3	9.3	132	133				
94	729.3	738.5	9.2	133	134				
95	738.5	748.1	9.6	134	135				
96	748.1	764.7	16.6	135	136				
97	764.7	790.0	25.3	136	137	138	139	140	142
98	790.0	799.0	9.0	142					
99	799.0	810.0	11.0	143	144	145			
100	810.0	819.5	9.5	145	146				
101	819.5	843.8	24.3	146	147	148			
102	843.8	858.9	15.1	148	149	150			
103	858.9	868.2	9.3	150	151				
104	868.2	878.5	10.3	151	152				
105	878.5	887.8	9.3	152	153	154			
106	887.8	897.7	9.9	154	155				
107	897.7	907.5	9.8	155	156				
108	907.5	921.7	14.2	156	157				

CORE BOX RECORD FORM
(p. 4)

Box #	Driller's Depth (ft) Top	Bottom	Interval	Core runs in box 1	2	3	4	5	6
109	921.7	935.7	14.0	157	158				
110	935.7	944.3	8.6	158	159				
111	944.3	954.9	10.6	159	160				
112	954.9	967.5	12.6	161	162				
113	967.5	976.6	9.1	162	163				
114	976.6	985.3	8.7	163	164				
115	985.3	995.1	9.8	164	165				
116	995.1	1004.7	9.6	165	166				
117	1004.7	1013.8	9.1	166	167				
118	1013.8	1023.4	9.6	167	168				
119	1023.4	1033.0	9.6	168	169				
120	1033.0	1045.9	12.9	169	170				
121	1045.9	1055.1	9.2	170	171				
122	1055.1	1064.5	9.4	171	172	173			
123	1064.5	1072.6	8.1	174					
124	1072.6	1080.4	7.8	174	175				
125	1080.4	1091.2	10.8	175	176	177			
126	1091.2	1101.2	10.0	177	178				
127	1101.2	1110.3	9.1	178	179				
128	1110.3	1120.1	9.8	179	180				
129	1120.1	1130.0	9.9	180	181				
130	1130.0	1139.0	9.0	181	182				
131	1139.0	1148.0	9.0	182	183				
132	1148.0	1156.8	8.8	183					
133	1156.8	1166.9	10.1	183	184	185			
134	1166.9	1175.9	9.0	185	186				
135	1175.9	1185.9	10.0	186	187				
136	1185.9	1195.7	9.8	187	188				
137	1195.7	1205.5	9.8	188	189				
138	1205.5	1215.9	10.4	189	190				
139	1215.9	1225.2	9.3	190	191				
140	1225.2	1234.9	9.7	191	192				
141	1234.9	1244.4	9.5	192	193				
142	1244.4	1254.1	9.7	193	194				
143	1254.1	1263.7	9.6	194	195				
144	1263.7	1270.4	6.7	195	196				

CORE BOX RECORD FORM
(p. 5)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
145	1270.4	1284.3	13.9	196	197				
146	1284.3	1292.3	8.0	197	198				
147	1292.3	1302.0	9.7	198	199				
148	1302.0	1312.7	10.7	199	200	201	202		
149	1312.7	1322.6	9.9	202	203				
150	1322.6	1332.2	9.6	203	204				
151	1332.2	1341.8	9.6	204	205				
152	1341.8	1354.0	12.2	205	206	207			
153	1354.0	1363.5	9.5	207	208				
154	1363.5	1372.8	9.3	208	208.5	209			
155	1372.8	1381.5	8.7	209	210				
156	1381.5	1391.4	9.9	210	211	212			
157	1391.4	1398.9	7.5	212	213				
158	1398.9	1407.1	8.2	213	214				
159	1407.1	1417.4	10.3	214	215				
160	1417.4	1427.9	10.5	215	216				
161	1427.9	1436.9	9.0	216	217				
162	1436.9	1446.9	10.0	217	218				
163	1446.9	1456.3	9.4	218	219				
164	1456.3	1465.5	9.2	219	220				
165	1465.5	1475.0	9.5	220					
166	1475.0	1483.7	8.7	220	221				
167	1483.7	1492.2	8.5	221	222				
168	1492.2	1503.2	11.0	222	223				
169	1503.2	1512.5	9.3	223	224				
170	1512.5	1522.2	9.7	224	225				
171	1522.2	1531.6	9.4	225	226				
172	1531.6	1540.7	9.1	226	227				
173	1540.7	1551.7	11.0	227	228	229			
174	1551.7	1561.2	9.5	229	230				
175	1561.2	1570.5	9.3	230	231				
176	1570.5	1579.7	9.2	231	232				
177	1579.7	1588.5	8.8	232	233				
178	1588.5	1598.5	10.0	233	234				
179	1598.5	1607.9	9.4	234					
180	1607.9	1618.0	10.1	234	235				

CORE BOX RECORD FORM
(p. 6)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
181	1618.0	1629.0	11.0	236	237	238			
182	1629.0	1638.4	9.4	238	239				
183	1638.4	1647.5	9.1	239	240				
184	1647.5	1656.7	9.2	240	241				
185	1656.7	1666.5	9.8	241	242				
186	1666.5	1674.4	7.9	242					
187	1674.4	1683.6	9.2	242	243				
188	1683.6	1692.0	8.4	243	244				
189	1692.0	1701.0	9.0	244	245				
190	1701.0	1711.0	10.0	246	247				
191	1711.0	1720.0	9.0	247	248				
192	1720.0	1730.1	10.1	248	249	250			
193	1730.1	1740.6	10.5	250	251				
194	1740.6	1751.7	11.1	251	252				
195	1751.7	1763.2	11.5	252	253	254			
196	1763.2	1773.5	10.3	254	255	256			
197	1773.5	1782.0	8.5	256	257	258	259		
198	1782.0	1793.0	11.0	259	260	261			
199	1793.0	1802.6	9.6	261					
200	1802.6	1811.8	9.2	261	262				
201	1811.8	1821.5	9.7	262	263				
202	1821.5	1831.5	10.0	263	264	265			
203	1831.5	1842.0	10.5	265	266				
204	1842.0	1853.2	11.2	267	268				
205	1853.2	1866.0	12.8	268	269	270			
206	1866.0	1877.8	11.8	271	272	273	274		
207	1877.8	1887.7	9.9	274	275				
208	1887.7	1905.6	17.9	275	276	277	278	279	280
209	1905.6	1916.6	11.0	280	281				
210	1916.6	1926.7	10.1	281	282	283			
211	1926.7	1938.0	11.3	283	284	285	286		
212	1938.0	1949.2	11.2	286	287				
213	1949.2	1958.5	9.3	287	288				
214	1958.5	1967.8	9.3	288	289				
215	1967.8	1976.8	9.0	289	290				
216	1976.8	1986.1	9.3	290	291				

CORE BOX RECORD FORM
(p. 7)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
217	1986.1	1997.0	10.9	291	292				
218	1997.0	2006.5	9.5	293	294				
219	2006.5	2017.8	11.3	294	295	296	297		
220	2017.8	2028.8	11.0	297	298	299			
221	2028.8	2042.6	13.8	299	300	301	302	303	
222	2042.6	2052.0	9.4	303					
223	2052.0	2061.2	9.2	304					
224	2061.2	2072.1	10.9	304	305	306			
225	2072.1	2084.9	12.8	306	307				
226	2084.9	2098.4	13.5	307	308	309			
227	2098.4	2105.6	7.2	309	310				
228	2105.6	2113.9	8.3	310					
229	2113.9	2123.0	9.1	310	311				
230	2123.0	2133.0	10.0	311	312				
231	2133.0	2142.5	9.5	312	313				
232	2142.5	2151.8	9.3	313	314				
233	2151.8	2161.1	9.3	314	315				
234	2161.1	2169.8	8.7	315	316				
235	2169.8	2179.2	9.4	316	317				
236	2179.2	2187.0	7.8	317					
237	2187.0	2196.2	9.2	318	319				
238	2196.2	2205.5	9.3	319					
239	2205.5	2216.1	10.6	320	321				
240	2216.1	2225.6	9.5	321	322				
241	2225.6	2234.5	8.9	322	323				
242	2234.5	2246.0	11.5	323	324				
243	2246.0	2254.1	8.1	324	325				
244	2254.1	2262.2	8.1	325	326	327			
245	2262.2	2274.7	12.5	327	328				
246	2274.7	2283.7	9.0	328	329				
247	2283.7	2296.4	12.7	329	330	331			
248	2296.4	2309.2	12.8	331	332				
249	2309.2	2317.9	8.7	332	333				
250	2317.9	2327.2	9.3	333	334				
251	2327.2	2339.0	11.8	334	335				
252	2339.0	2356.4	17.4	336	337	338	339		

CORE BOX RECORD FORM
(p. 8)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
253	2356.4	2365.8	9.4	339	340				
254	2365.8	2374.3	8.5	340	341				
255	2374.3	2384.2	9.9	341	342				
256	2384.2	2394.6	10.4	342	343				
257	2394.6	2404.4	9.8	343	344				
258	2404.4	2418.5	14.1	344	345	346			
259	2418.5	2428.2	9.7	346	347				
260	2428.2	2438.3	10.1	347	348				
261	2438.3	2448.1	9.8	348	349				
262	2448.1	2457.9	9.8	349	350				
263	2457.9	2468.3	10.4	350	351				
264	2468.3	2484.4	16.1	351	352	353	354		
265	2484.2	2492.4	8.2	355	356				
266	2492.4	2505.7	13.3	356	357				
267	2505.7	2515.4	9.7	357	358				
268	2515.4	2524.3	8.9	358	359				
269	2524.3	2534.5	10.2	359	360				
270	2534.5	2550.6	16.1	360	361	362			
271	2550.6	2566.3	15.7	362	363	364	365		
272	2566.3	2579.9	13.6	365	366				
273	2579.9	2591.0	11.1	366	367				
274	2591.0	2601.0	10.0	368					
275	2601.0	2619.3	18.3	369	370				
276	2619.3	2629.2	9.9	370	371				
277	2629.2	2645.0	15.8	371	372	373			
278	2645.0	2654.9	9.9	373	374				
279	2654.9	2665.6	10.7	374	375				
280	2665.6	2675.8	10.2	375	376				
281	2675.8	2687.0	11.2	376	377				
282	2687.0	2698.4	11.4	378	379				
283	2698.4	2712.3	13.9	379	380	381			
284	2712.3	2722.0	9.7	381	382				
285	2722.0	2737.0	15.0	382	383	384	385		
286	2737.0	2746.3	9.3	385	386				
287	2746.3	2756.0	9.7	386					
288	2756.0	2766.5	10.5	387	388				

CORE BOX RECORD FORM
(p. 9)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
289	2766.5	2779.6	13.1	389	390				
290	2779.6	2802.3	22.7	390	391	392	393	394	
291	2802.3	2812.7	10.4	394	395				
292	2812.7	2821.4	8.7	395	396				
293	2821.4	2828.6	7.2	396	397				
294	2828.6	2838.0	9.4	397	398				
295	2838.0	2847.3	9.3	398	399				
296	2847.3	2857.7	10.4	399	400				
297	2857.7	2867.0	9.3	400					
298	2867.0	2877.0	10.0	401					
299	2877.0	2889.3	12.3	402	403				
300	2889.3	2900.5	11.2	403	404				
301	2900.5	2911.9	11.4	404	405				
302	2911.9	2922.7	10.8	405	406				
303	2922.7	2932.6	9.9	406	407				
304	2932.6	2942.4	9.8	407	408				
305	2942.4	2953.0	10.6	408	409				
306	2953.0	2971.9	18.9	409	410	411			
307	2971.9	2983.8	11.9	411	412				
308	2983.8	3001.0	17.2	412	413	416			
309	3001.0	3010.5	9.5	417					
310	3010.5	3019.9	9.4	417	418				
311	3019.9	3029.6	9.7	418	419				
312	3029.6	3038.5	8.9	419	420				
313	3038.5	3047.8	9.3	420	421				
314	3047.8	3057.7	9.9	421	422				
315	3057.7	3067.1	9.4	422	423				
316	3067.1	3076.3	9.2	423	424				
317	3076.3	3085.2	8.9	424	425				
318	3085.2	3104.7	19.5	425	426	427	428		
319	3104.7	3118.5	13.8	428	429				
320	3118.5	3131.0	12.5	429	430	431			
321	3131.0	3143.0	12.0	431	432				
322	3143.0	3152.3	9.3	432	433				
323	3152.3	3163.0	10.7	433	434				
324	3163.0	3172.6	9.6	434	435				

CORE BOX RECORD FORM
(p. 10)

	Driller's Depth (ft)			Core runs in box					
Box #	Top	Bottom	Interval	1	2	3	4	5	6
325	3172.6	3181.8	9.2	435	436				
326	3181.8	3191.9	10.1	436	437				
327	3191.9	3199.0	7.1	437	438				
328	3199.0	3213.7	14.7	438	439	440			
329	3213.7	3230.0	16.3	440	441	442			
330	3230.0	3241.5	11.5	442	443				
331	3241.5	3250.9	9.4	443	444				
332	3250.9	3261.0	10.1	444	445				
333	3261.0	3270.1	9.1	446					
334	3270.1	3281.1	11.0	446	447	448			
335	3281.1	3290.6	9.5	448	449				
336	3290.6	3301.3	10.7	449	450	451			
337	3301.3	3310.6	9.3	451	452				
338	3310.6	3319.4	8.8	452					
339	3319.4	3330.8	11.4	452	453				
340	3330.8	3338.5	7.7	453	454	455			
341	3338.5	3347.1	8.6	455	456				
342	3347.1	3356.3	9.2	456	457				
343	3356.3	3365.6	9.3	457					
344	3365.6	3375.0	9.4	457	458				
345	3375.0	3384.7	9.7	458	459				
346	3384.7	3395.5	10.8	459	460				
347	3395.5	3402.6	7.1	460	461				
348	3402.6	3413.2	10.6	461	462				
349	3413.2	3422.2	9.0	462	463				
350	3422.2	3432.5	10.3	463	464				
351	3432.5	3442.5	10.0	464	465				
352	3442.5	3451.6	9.1	465	466				
353	3451.6	3462.9	11.3	466	467				
354	3462.9	3464.0	1.1	467					

Unit Summary
(p. 1)

Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
1	moderately plagioclase-olivine phyric basalt	1	1	0	**26.0**	7	5	2.8	**45.2**	19.2	
2	sparsely to moderately plagioclase-olivine phyric basalt	8	5	2.8	**45.2**	17	22	3	**101.3**	56.1	R11-3.9 (68.9'), R14-2.4 (75.0')
3	calcareous sediment (coral rudstone)	17	22	3.0	**101.3**	17	23	0	**101.6**	0.3	
4	calcareous sediment	17	25	0	**101.6**	17	25	0.6	**102.2**	0.6	
5	coral	18	25	0.6	**102.2**	18	25	0.8	**102.4**	0.2	
6	calcareous sediment (matrix to clast supported)	18	25	0.8	**102.4**	21	28	2.0	**112.5**	10.1	
7	matrix supported calcareous sediment	21	28	2.0	**112.5**	21	29	1.2	**115.2**	2.7	
8	calcareous sediment	22	29	1.2	**115.2**	24	31	5.4	**127.4**	12.2	
9	calcareous sediment	24	31	5.4	**127.4**	26	34	1.0	**153.0**	25.6	
10	calcareous sediment (clast -supported)	26	34	1.0	**153.0**	31	40	0.5	**185.5**	32.5	
11	moderately to highly olivine phyric basalt	32	40	0.5	**185.5**	49	65	4.6	**297.4**	111.9	R41-3.0 (195.0'), R43-2.7 (201.9')
12	lithic to vitric volcaniclastic silt (with coral and shell fragments)	49	65	4.6	**297.4**	49	65	5.1	**297.9**	0.5	
13	moderately to highly olivine phyric basalt	49	65	5.1	**297.9**	51	69	3.7	**316.2**	18.3	R67-0.7 (303.2')
14	moderately to highly olivine phyric basalt	51	69	3.7	**316.2**	55	77	5.0	**357.3**	41.1	
15	moderately to highly olivine phyric basalt	55	78	0.0	**357.5**	64	93	4.8	**436.8**	79.3	R78-4.8 (362.3'), R86-0.4 (398.0')
16	highly olivine phyric basalt	64	93	4.8	**436.8**	67	100	3.9	**471.0**	34.2	
17	moderately to highly olivine phyric basalt	68	100	3.9	**471.0**	71	107	0.7	**502.7**	31.7	
18	fine-grained highly weathered volcanic ash	71	107	0.7	**502.7**	71	107	0.7	**502.7**	0.0	
19	aphyric basalt	71	107	0.7	**502.7**	72	108	8.5	**515.7**	13.0	

Unit Summary
(p. 2)

Unit #	Unit Name	Top Box#	Top Core #	Top Relative depth	Top True depth (ft)	Bottom Box#	Bottom Core #	Bottom Relative depth	Bottom True depth (ft)	Thickness (ft)	Notes (including depths to internal contacts)
20	aphyric basalt	72	108	8.5	**515.7**	74	110	9.7	**536.9**	21.2	
21	aphyric basalt	75	110	9.7	**536.9**	76	112	2.1	**549.6**	12.7	R111-7.0 (544.0'), R112-0.5 (548.0')
22	black sand-volcaniclastic sedimen	76	112	2.1	**549.6**	76	113	0.3	**564.3**	14.7	
23	aphyric basalt	76	113	0.3	**564.3**	80	116	0.3	**594.3**	30.0	R113-1.0 (565.0'), R113-3.3 (567.3')
24	weathered volcanic ash/soil	80	116	0.3	**594.3**	80	116	4.1	**598.1**	3.8	
25	aphyric basalt	80	116	4.1	**598.1**	80	116	5.1	**599.1**	1.0	
26	highly weathered volcanic ash/soil	80	116	5.1	**599.1**	80	116	6.0	**600.0**	0.9	
27	aphyric basalt	80	116	6.0	**600.0**	81	117	4.0	**608.2**	8.2	
28	moderately to highly olivine phyric basalt	81	117	4.0	**608.2**	84	122	5.3	**638.8**	30.6	
29	moderately olivine phyric basalt	84	122	5.3	**638.8**	88	127	5.4	**669.8**	31.0	
30	highly olivine phyric basalt	88	127	5.4	**669.8**	88	128	2.6	**677.0**	7.2	
31	highly olivine phyric basalt	88	128	2.6	**677.0**	89	128	8.0	**682.4**	5.4	
32	highly olivine phyric basalt	89	128	8.0	**682.4**	91	130	6.1	**702.1**	19.7	soil at top, soil at base
33	highly olivine phyric basalt	91	130	6.1	**702.1**	91	130	10.4	**706.4**	4.3	weathered material/ash ~1.5' from top
34	highly olivine phyric basalt	91	130	10.4	**706.4**	95	134	9.0	**745.2**	38.8	
35	highly olivine phyric basalt	95	134	9.0	**745.2**	96	135	7.0	**754.0**	8.8	
36	hyaloclastite/altered fragmental basalt	96	135	7.0	**754.0**	97	140	0.0	**784.0**	30.0	
37	moderately to highly olivine phyric basalt	97	140	0.0	**784.0**	101	146	2.6	**820.1**	36.1	
38	volcaniclastic sand (green)	101	146	2.6	**820.1**	102	149	0.0	**847.0**	26.9	

Unit Summary
(p. 3)

Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
39	sparsely olivine phyric basalt	102	149	0.0	**847.0**	102	149	3.0	**850.0**	3.0	internal sandy layer (R149-0.7; 847.7'); pyroclastic units at base (R149-2.7; 849.7')
40	highly olivine phyric basalt	102	149	3.0	**850.0**	102	150	2.5	**855.5**	5.5	
41	weathered ash	103	150	2.5	**855.5**	103	150	3.3	**856.3**	0.8	
42	aphyric basalt	103	150	3.3	**856.3**	103	150	4.1	**857.1**	0.8	
43	moderately olivine phyric basalt	103	150	4.1	**857.1**	108	157	0.0	**917.0**	59.9	soil at top tentative base of Mauna Loa section
44	clay-rich soil	108	157	0.0	**917.0**	108	157	1.0	**918.0**	1.0	
45	sparsely to highly olivine phyric basalt	108	157	1.0	**918.0**	109	158	6.6	**929.4**	11.4	tentative top of Mauna Kea section
46	aphyric to moderately olivine phyric basalt	109	158	6.6	**929.4**	110	159	3.5	**936.1**	6.7	
47	aphyric to highly olivine phyric basalt	110	159	3.5	**936.1**	112	160	8.9	**951.4**	15.3	R160-1.0 (943.5'), R160-3.0 (945.5')
48	weathered ash	112	160	8.9	**951.4**	112	160	9.1	**951.6**	0.2	
49	moderately magnetite-olivine-plagioclase phyric basalt	112	160	9.1	**951.6**	115	165	5.8	**993.6**	42.0	
50	aphyric basalt	115	165	5.8	**993.6**	116	166	3.1	**1001.0**	7.4	
51	aphyric basalt	116	166	3.1	**1001.0**	116	166	7.7	**1005.6**	4.6	
52	aphyric basalt	117	166	7.7	**1005.6**	118	167	8.0	**1016.2**	10.6	
53	aphyric to moderately olivine phyric basalt	118	167	8.0	**1016.2**	119	168	9.55	**1028.1**	11.9	
54	sparsely olivine phyric basalt	119	168	9.55	**1028.1**	120	170	4.1	**1039.4**	11.4	
55	moderately to highly olivine phyric basalt	120	170	4.1	**1039.4**	122	172	0.0	**1057.0**	17.6	
56	aphyric basalt	122	172	0.0	**1057.0**	122	172	3.0	**1060.0**	3.0	ash infilling fracture near top of flow
57	aphyric basalt	122	172	3.0	**1060.0**	124	175	1.3	**1076.7**	16.7	

Unit Summary
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Unit #	Unit Name	Top Box#	Top Core #	Top Relative depth	Top True depth (ft)	Bottom Box#	Bottom Core #	Bottom Relative depth	Bottom True depth (ft)	Thickness (ft)	Notes (including depths to internal contacts)
58	aphyric basalt	124	175	1.3	1076.7	127	179	3.0	1108.9	32.2	
59	moderately olivine phyric basalt	127	179	3.0	1108.9	130	181	7.85	1134.5	25.5	
60	highly olivine phyric basalt	130	181	7.85	1134.5	131	182	3.25	1140.2	5.7	ash at top
61	highly olivine phyric basalt	131	182	3.25	1140.2	132	183	5.3	1152.5	12.4	ash at top
62	moderately olivine phyric basalt	132	183	5.3	1152.5	134	186	6.2	1173.2	20.7	
63	aphyric basalt	134	186	6.2	1173.2	135	187	7.6	1184.9	11.7	ash infillings at top
64	highly olivine phyric basalt	135	187	7.6	1184.9	139	190	9.5	1216.9	32.0	ash at top
65	highly olivine phyric basalt	139	190	9.5	1216.9	140	192	1.15	1228.3	11.4	R191-1.8 (1219.2'), R191-5.8 (1223.2')
66	sparsely olivine phyric basalt	140	192	1.15	1228.3	140	192	5.7	1232.8	4.6	
67	aphyric basalt	140	192	5.7	1232.8	141	192	8.0	1235.1	2.3	
68	moderately to highly olivine phyric basalt	141	192	8.0	1235.1	141	193	1.1	1238.3	3.2	soil/ash at top
69	highly olivine basalt	141	193	1.1	1238.3	143	194	9.4	1256.6	18.3	R193-7.5 (1244.7'), R193-8.5 (1245.7'), R193-9.5 (1246.7'), R194-0.5 (1247.7'), R194-4.5 (1251.7')
70	highly olivine phyric basalt	143	194	9.4	1256.6	146	197	10.0	1286.9	30.3	
71	sparsely olivine phyric basalt	146	197	10.0	1286.9	147	199	4.2	1301.4	14.5	ash at top
72	sparsely to moderately olivine phyric basalt	147	199	4.2	1301.4	150	203	3.8	1320.8	19.4	
73	aphyric to moderately olivine phyric basalt	150	203	3.8	1320.8	151	205	4.2	1341.4	20.6	
74	sparsely olivine phyric basalt	151	205	4.2	1341.4	152	206	0.5	1347.5	6.1	
75	moderately (plagioclase)-olivine phyric basalt	152	206	0.5	1347.5	155	210	0.0	1377.0	29.5	
76	highly olivine phyric basalt	155	210	0.0	1377.0	157	212	5.0	1396.0	19.0	

Unit Summary
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Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
77	sparsely to moderately olivine phyric basalt	157	212	5.0	1396.0	157	213	0.1	1398.8	2.8	
78	moderately to highly olivine phyric basalt	157	213	0.1	1398.8	159	214	8.8	1414.6	15.8	
79	highly olivine phyric basalt	159	214	8.8	1414.6	159	215	2.5	1418.4	3.8	
80	highly olivine phyric basalt	159	215	2.5	1418.4	161	216	3.1	1429.0	10.6	
81	highly olivine phyric basalt	161	216	3.1	1429.0	161	217	2.0	1437.5	8.5	R216-9.3 (1435.2')
82	highly olivine phyric basalt	162	217	2.0	1437.5	162	217	9.5	1445.0	7.5	R217-3.7 (1439.2')
83	moderately to highly olivine phyric basalt	162	217	9.5	1445.0	163	218	4.5	1450.1	5.1	R218-3.3 (1448.9') baked ash at top
84	highly olivine phyric basalt	163	218	4.5	1450.1	163	218	6.0	1451.6	1.5	
85	highly olivine phyric basalt	163	218	6.0	1451.6	163	218	9.5	1455.1	3.5	R218-6.9 (1452.5')
86	moderately to highly olivine phyric basalt	163	218	9.5	1455.1	164	219	8.8	1464.5	9.4	
87	moderately to highly olivine phyric basalt	164	219	8.8	1464.5	165	220	5.1	1470.7	6.2	
88	aphyric to sparsely olivine phyric basalt	165	220	5.1	1470.7	167	222	0.0	1486.1	15.4	baked ash/soil at top
89	moderately olivine phyric basalt	167	222	0.0	1486.1	169	224	7.1	1512.4	26.3	
90	moderately olivine phyric basalt	169	224	7.1	1512.4	171	226	3.1	1528.9	16.5	
91	moderately to highly olivine phyric basalt	171	226	3.1	1528.9	174	230	0.0	1558.8	29.9	
92	highly olivine phyric basalt	174	230	0.0	1558.8	175	230	7.8	1566.6	7.8	R230-1.4 (1560.2')
93	highly (plagioclase)-olivine phyric basalt	175	230	7.8	1566.6	176	231	6.5	1575.0	8.4	R231-3.9 (1572.4')
94	highly olivine phyric basalt	176	231	6.5	1575.0	177	232	5.3	1584.1	9.1	R232-1.9 (1580.7'), R232-4.4 (1583.2')
95	highly olivine phyric basalt	177	232	5.3	1584.1	178	233	1.1	1589.9	5.8	R232-7.8 (1586.6')

Unit Summary
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Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
96	moderately to highly olivine phyric basalt	178	233	1.1	1589.9	178	233	10.0	1598.8	8.9	
97	moderately to highly olivine phyric basalt	178	233	10.0	1598.8	180	235	6.7	1615.7	16.9	
98	moderately to highly olivine phyric basalt	180	235	6.7	1615.7	181	237	1.5	1624.5	8.8	
99	highly olivine phyric basalt	181	237	1.5	1624.5	184	240	4.0	1649.3	24.8	
100	highly olivine phyric basalt	184	240	4.0	1649.3	185	241	7.3	1662.8	13.5	R240-7.7 (1653.0') baked aeolian material/ash at top
101	highly olivine phyric basalt	185	241	7.3	1662.8	185	241	9.5	1665.0	2.2	ash/soil at top
102	highly olivine phyric basalt	185	241	9.5	1665.0	186	242	7.7	1673.2	8.2	
103	highly olivine phyric basalt	186	242	7.7	1673.2	189	244	8.9	1694.4	21.2	
104	moderately olivine phyric basalt	189	244	8.9	1694.4	189	245	0.8	1696.3	1.9	thin ash at top
105	highly olivine phyric basalt	189	245	0.8	1696.3	190	247	3.0	1710.9	14.6	
106	moderately to highly olivine phyric basalt	191	247	3.0	1710.9	193	250	7.5	1735.2	24.3	
107	sparsely to moderately olivine phyric basalt	193	250	7.5	1735.2	195	253	1.6	1756.6	21.4	
108	moderately olivine phyric basalt	195	253	1.6	1756.6	196	256	3.8	1772.8	16.2	
109	highly olivine phyric basalt	196	256	3.8	1772.8	198	260	1.0	1788.6	15.8	
110	moderately to highly olivine phyric basalt	198	260	1.0	1788.6	200	261.5	9.3	1806.0	17.4	
111	moderately to highly olivine phyric basalt	200	261.5	9.3	1806.0	202	263	9.6	1824.6	18.6	ash/soil at top
112	highly olivine phyric basalt	202	263	9.6	1824.6	202	265	3.3	1828.5	3.9	R265-0.2 (1825.4')
113	moderately to highly olivine phyric basalt	202	265	3.3	1828.5	204	268	1.9	1851.9	23.4	R265-5.0 (1830.2'), R267-0.7 (1842.7'), R267-2.1 (1844.1')
114	highly olivine phyric basalt	204	268	1.9	1851.9	205	270	2.1	1859.6	7.7	

Unit Summary
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Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
115	aphyric basalt	205	270	2.1	1859.6	205	270	6.0	1863.5	3.9	R270-3.3 (1860.8'), R270-4.8 (1862.3')
116	highly olivine phyric basalt	206	270	6.0	1863.5	210	283	0.0	1922.0	58.5	R275-1.5 (1882.6'), R275-2.2 (1883.3), R280-6.3 (1908.3'), R281-2.4 (1911.6'), R281-3.4 (1912.6')
117	moderately plagioclase-olivine phyric basalt	210	283	0.0	1922.0	211	285	1.0	1932.1	10.1	
118	moderately to highly olivine phyric basalt	211	285	1.0	1932.1	212	286	7.4	1942.4	10.3	
119	aphyric basalt	212	286	7.4	1942.4	215	289	4.8	1967.3	24.9	R288-1.0 (1955.7') ash/soil at top
120	moderately olivine phyric basalt	215	289	4.8	1967.3	217	292	1.6	1992.8	25.5	
121	moderately olivine phyric basalt	217	292	1.6	1992.8	217	292	3.0	1994.2	1.4	
122	highly olivine phyric basalt	217	292	3.0	1994.2	218	293	1.0	1998.0	3.8	
123	moderately olivine phyric basalt	218	293	1.0	1998.0	218	294	1.5	2000.8	2.8	
124	highly olivine phyric basalt	218	294	1.5	2000.8	218	294	6.5	2005.8	5.0	
125	highly olivine phyric basalt	219	294	6.5	2005.8	220	298	6.5	2026.0	20.2	
126	highly olivine phyric basalt	220	298	6.5	2026.0	223	304	7.3	2059.4	33.4	
127	aphyric basalt	223	304	7.3	2059.4	224	305	6.1	2068.2	8.8	baked soil/ash at top
128	sparsely olivine phyric basalt	224	305	6.1	2068.2	225	307	2.8	2082.8	14.6	R306-5.85 (2076.9'), R306-7.4 (2078.4'), R307-0.7 (2080.7')
129	sparsely olivine phyric basalt	226	307	2.8	2082.8	226	308	4.8	2090.7	7.9	
130	sparsely olivine phyric basalt	226	308	4.8	2090.7	228	310	6.2	2111.2	20.5	
131	aphyric basalt	228	310	6.2	2111.2	230	312	1.3	2127.4	16.2	R311-9.2 (2124.8')
132	highly olivine phyric basalt	230	312	1.3	2127.4	234	316	1.8	2168.0	40.6	
133	moderately olivine phyric basalt	234	316	1.8	2168.0	234	316	3.6	2169.8	1.8	soil/ash at top

Unit Summary
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Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
134	moderately olivine phyric basalt	234	316	3.6	**2169.8**	235	316	7.2	**2173.4**	3.6	
135	sparsely olivine phyric basalt	235	316	7.2	**2173.4**	235	316	8.7	**2174.9**	1.5	
136	moderately to highly olivine phyric basalt	235	316	8.7	**2174.9**	237	318	2.5	**2189.6**	14.7	
137	highly olivine phyric basalt	237	318	2.5	**2189.6**	238	319	10.7	**2205.7**	16.1	
138	moderately to highly olivine phyric basalt	239	320	0.0	**2205.7**	241	322	8.0	**2227.7**	22.0	
139	aphyric basalt	241	322	8.0	**2227.7**	242	323	9.5	**2239.4**	11.7	R322-9.5 (2229.2'), R323-0.8 (2230.7')
140	aphyric basalt	242	323	9.5	**2239.4**	243	324	9.0	**2249.0**	9.6	R324-4.5 (2244.5'), R324-5.3 (2245.3'), R324-7.0 (2247.0')
141	aphyric to sparsely olivine phyric basalt	243	324	9.0	**2249.0**	246	328	1.9	**2272.5**	23.5	
142	aphyric basalt	246	328	1.9	**2272.5**	247	331	0.0	**2291.5**	19.0	
143	highly olivine phyric basalt	247	331	0.0	**2291.5**	248	332	1.6	**2303.6**	12.1	R331-6.1 (2297.6')
144	highly olivine phyric basalt	248	332	1.6	**2303.6**	250	334	0.2	**2319.7**	16.1	
145	moderately to highly olivine phyric basalt	250	334	0.2	**2319.7**	251	335	5.5	**2335.1**	15.4	R334-6.9 (2326.4'), R334-7.9 (2327.4'), R334-8.6 (2328.1'), R334-9.3 (2328.8'), R335-2.0 (2331.6')
146	moderately to highly olivine phyric basalt	251	335	5.5	**2335.1**	252	337	0.0	**2341.0**	5.9	
147	highly olivine phyric basalt	252	337	0.0	**2341.0**	254	341	5.2	**2372.0**	31.0	R337-1.4 (2342.4'), R337-2.9 (2343.9'), R339-4.3 (2355.3')
148	aphyric basalt	254	341	5.2	**2372.0**	255	342	0.6	**2377.1**	5.1	baked ash/soil at top
149	sparsely to highly olivine phyric basalt	255	342	0.6	**2377.1**	257	344	5.2	**2402.2**	25.1	R342-6.2 (2382.7'), R344-4.2 (2401.2')
150	highly olivine phyric basalt	257	344	5.2	**2402.2**	258	346	1.0	**2412.8**	10.6	
151	highly olivine phyric basalt	258	346	1.0	**2412.8**	259	347	3.4	**2420.5**	7.7	
152	highly olivine phyric basalt	259	347	3.4	**2420.5**	260	348	2.6	**2435.1**	14.6	

Unit Summary
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Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
153	sparsely to moderately plagioclase-olivine phyric basalt	260	348	2.6	2435.1	263	350	8.0	2457.5	22.4	
154	sparsely to highly olivine phyric basalt	263	350	8.0	2457.5	264	352	1.8	2471.1	13.6	
155	sparsely olivine phyric basalt	264	352	1.8	2471.1	266	357	0.3	2498.3	27.2	
156	highly olivine phyric basalt	266	357	0.3	2498.3	268	359	4.2	2520.2	21.9	R357-4.3 (2502.3')
157	highly olivine phyric basalt	268	359	4.2	2520.2	269	359	9.1	2525.1	4.9	
158	highly olivine phyric basalt	269	359	9.1	2525.1	271	363	0.3	2551.0	25.9	
159	highly olivine phyric basalt	271	363	0.3	2551.0	273	367	2.6	2585.6	34.6	
160	highly olivine phyric basalt	273	367	2.6	2585.6	274	368	5.7	2596.7	11.1	
161	highly olivine phyric basalt	274	368	5.7	2596.7	274	368	8.8	2599.8	3.1	
162	highly olivine phyric basalt	274	368	8.8	2599.8	275	369	3.3	2604.3	4.5	
163	moderately olivine phyric basalt	275	369	3.3	2604.3	275	370	1.3	2612.3	8.0	
164	highly olivine phyric basalt	275	370	1.3	2612.3	277	372	1.0	2632.0	19.7	
165	highly olivine phyric basalt	277	372	1.0	2632.0	280	375	8.7	2664.4	32.4	
166	moderately to highly olivine phyric basalt	280	375	8.7	2664.4	281	377	6.0	2682.9	18.5	
167	sparsely to moderately plagioclase-olivine phyric basalt	281	377	6.0	2682.9	283	380	3.2	2704.3	21.4	
168	highly olivine phyric basalt	283	380	3.2	2704.3	284	381	2.8	2712.8	8.5	R380-5.4 (2706.5')
169	highly olivine phyric basalt	284	381	2.8	2712.8	285	383	0.4	2726.7	13.9	
170	moderately olivine phyric basalt	285	383	0.4	2726.7	288	387	1.1	2757.1	30.4	"soil-like rubble" at top
171	sparsely olivine phyric basalt	288	387	1.1	2757.1	288	388	2.2	2764.5	7.4	

Unit Summary
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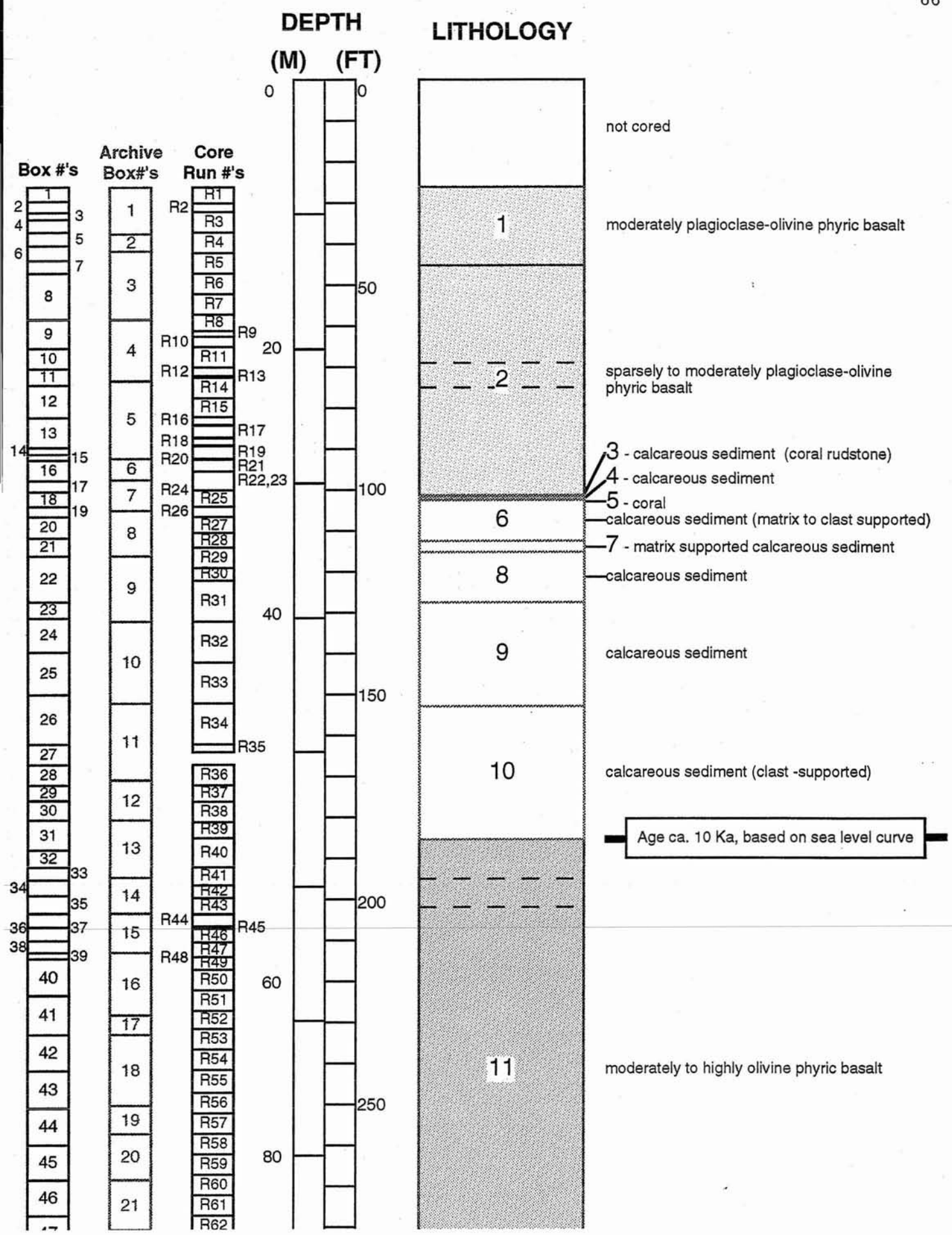
Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
172	aphyric basalt	288	388	2.2	**2764.5**	290	394	0.2	**2799.2**	34.7	R390-0.0 (2771.0')
173	aphyric basalt	290	394	0.2	**2799.2**	294	397	7.2	**2834.2**	35.0	R394-0.2 (2799.2'), R394-1.0 (2800.0'), R394-4.4 (2803.4'), R395-4.4 (2811.4'), R395-5.2 (2812.2'), R395-7.1 (2814.1'), R395-8.0 (2815.0'), R395-9.2 (2816.2'), R396-0.9 (2817.9'), R396-6.3 (2823.3'), R397-0.4 (2827.4')
174	moderately to highly olivine phyric basalt	294	397	7.2	**2834.2**	295	398	7.2	**2844.2**	10.0	soil at top
175	well-sorted, fine-grained volcanic sand	295	398	7.2	**2844.2**	295	398	8.8	**2845.8**	1.6	
176	aphyric to moderately olivine phyric basalt	295	398	8.8	**2845.8**	296	399	8.5	**2855.5**	9.7	
177	aphyric basalt	296	399	8.5	**2855.5**	299	402	1.7	**2878.7**	23.2	R400-7.6 (2864.6')
178	highly olivine phyric basalt	299	402	1.7	**2878.7**	300	404	1.3	**2894.8**	16.1	
179	highly olivine phyric basalt	300	404	1.3	**2894.8**	301	405	2.5	**2907.5**	12.7	
180	highly olivine phyric basalt	301	405	2.5	**2907.5**	301	405	6.4	**2911.4**	3.9	soil at top
181	moderately to highly olivine phyric basalt	302	405	6.4	**2911.4**	302	406	1.6	**2916.1**	4.7	
182	moderately to highly olivine phyric basalt	302	406	1.6	**2916.1**	303	407	3.0	**2926.5**	10.4	R406-4.4 (2918.9')
183	highly olivine phyric basalt	303	407	3.0	**2926.5**	303	407	6.3	**2929.8**	3.3	
184	highly olivine phyric basalt	304	407	6.3	**2929.8**	304	408	7.2	**2940.2**	10.4	
185	highly olivine phyric basalt	304	408	7.2	**2940.2**	305	409	2.7	**2945.8**	5.6	
186	highly olivine phyric basalt	305	409	2.7	**2945.8**	306	409	8.9	**2952.0**	6.2	soil at top
187	highly olivine phyric basalt	306	409	8.9	**2952.0**	306	411	0.0	**2965.0**	13.0	
188	highly olivine phyric basalt	306	411	0.0	**2965.0**	308	413	0.0	**2985.0**	20.0	R411-3.2 (2968.2')
189	highly olivine phyric basalt	308	413	0.0	**2985.0**	308	416	0.0	**2995.0**	10.0	
190	moderately olivine phyric basalt	308	416	0.0	**2995.0**	312	420	0.8	**3032.4**	37.4	

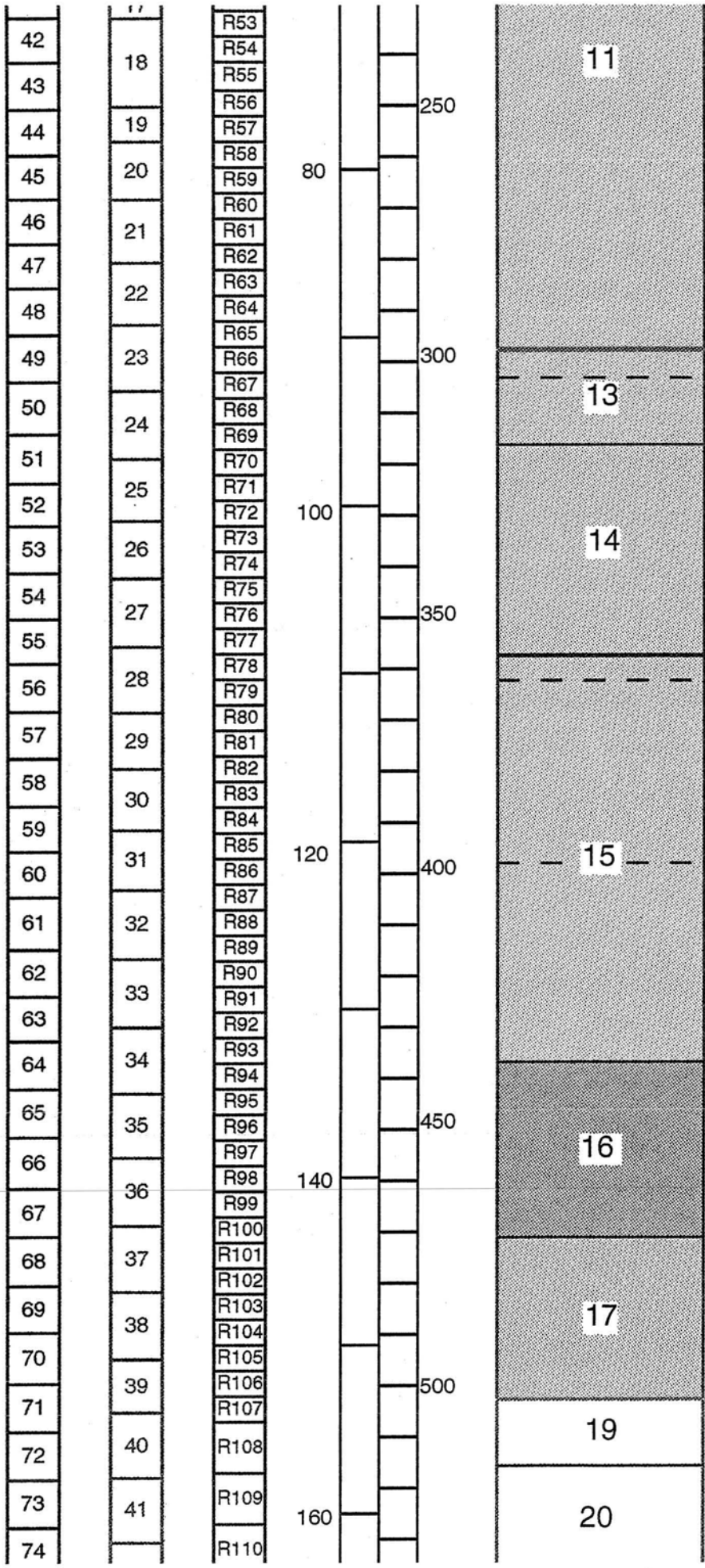
Unit Summary
(p. 11)

Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
191	aphyric basalt	312	420	0.8	3032.4	312	420	4.1	3035.7	3.3	
192	aphyric basalt	312	420	4.1	3035.7	312	420	7.0	3038.6	2.9	ash/soil at top
193	aphyric basalt	313	420	7.0	3038.6	313	421	0.6	3042.2	3.6	
194	aphyric basalt	313	421	0.6	3042.2	313	421	1.5	3043.1	0.9	
195	aphyric basalt	313	421	1.5	3043.1	315	423	2.9	3064.9	21.8	R422-5.1 (3056.8')
196	aphyric basalt	315	423	2.9	3064.9	318	426	2.2	3091.6	26.7	R424-2.5 (3074.4'), R425-3.0 (3085.0'), R425-4.2 (3086.2') soil/cinder at top
197	sparsely plagioclase-olivine phyric basalt	318	426	2.2	3091.6	319	428	7.0	3109.0	17.4	
198	highly olivine phyric basalt	319	428	7.0	3109.0	320	430	4.0	3123.0	14.0	
199	highly olivine phyric basalt	320	430	4.0	3123.0	321	431	2.2	3131.2	8.2	
200	highly olivine phyric basalt	321	431	2.2	3131.2	321	432	0.6	3139.3	8.1	
201	highly olivine phyric basalt	321	432	0.6	3139.3	322	433	2.4	3151.2	11.9	R432-5.4 (3144.1'), R433-0.0 (3148.8')
202	highly olivine phyric basalt	322	433	2.4	3151.2	323	434	2.1	3161.0	9.8	
203	aphyric to moderately olivine phyric basalt	323	434	2.1	3161.0	326	437	0.4	3189.8	28.8	R434-2.6 (3161.5'), R435-5.1 (3174.1'), R435-7.3 (3176.3'), R436-3.0 (3182.1'), R436-4.2 (3183.3'), R436-8.1 (3187.2'), R436-8.9 (3188.0')
204	sparsely olivine phyric basalt	326	437	0.4	3189.8	327	437	4.0	3193.4	3.6	
205	highly olivine phyric basalt	327	437	4.0	3193.4	328	439	0.9	3207.9	14.5	
206	moderately olivine phyric basalt	328	439	0.9	3207.9	329	440	5.1	3216.1	8.2	R440-0.0 (3211.0'), R440-3.2 (3214.2')
207	highly olivine phyric basalt	329	440	5.1	3216.1	329	441	4.1	3223.1	7.0	
208	highly olivine phyric basalt	329	441	4.1	3223.1	330	443	1.0	3235.8	12.7	
209	aphyric basalt	330	443	1.0	3235.8	332	444	9.6	3251.1	15.3	R444-3.6 (3245.1'), R444-6.2 (3247.7')

Unit Summary
(p. 12)

Unit #	Unit Name	Top				Bottom				Thickness (ft)	Notes (including depths to internal contacts)
		Box#	Core #	Relative depth	True depth (ft)	Box#	Core #	Relative depth	True depth (ft)		
210	aphyric basalt	332	444	9.6	3251.1	332	445	6.7	3258.2	7.1	R445-4.3 (3255.8') very thin ash at top
211	moderately to highly olivine phyric basalt	332	445	6.7	3258.2	333	446	7.9	3268.9	10.7	soil at top
212	moderately plagioclase-olivine phyric basalt	333	446	7.9	3268.9	334	447	3.8	3274.9	6.0	
213	sparsely olivine phyric basalt	334	447	3.8	3274.9	335	448	2.3	3280.3	5.4	
214	moderately olivine phyric basalt	335	448	2.3	3280.3	335	448	5.2	3283.2	2.9	soil at top
215	moderately plagioclase-olivine phyric basalt	335	448	5.2	3283.2	335	449	1.2	3287.2	4.0	
216	moderately olivine phyric basalt	335	449	1.2	3287.2	336	450	0.5	3293.5	6.3	
217	sparsely to moderately plagioclase-olivine phyric basalt	336	450	0.5	3293.5	337	451	10.4	3307.1	13.6	R450-2.0 (3295.0'), R451-0.8 (3297.5'), R451-2.5 (3299.2') thin soil at top
218	aphyric to moderately olivine phyric basalt	337	451	10.4	3307.1	340	453	3.7	3329.9	22.8	
219	aphyric basalt	340	453	3.7	3329.9	342	456	9.4	3356.5	26.6	
220	aphyric basalt	342	456	9.4	3356.5	344	458	2.4	3369.9	13.4	thin soil at top
221	aphyric basalt	344	458	2.4	3369.9	345	459	7.1	3385.0	15.1	
222	aphyric basalt	345	459	7.1	3385.0	346	460	4.0	3392.3	7.3	
223	aphyric basalt	346	460	4.0	3392.3	348	461	10.4	3407.7	15.4	R461-2.1 (3399.4'), R461-4.7 (3402.0'), R461-7.0 (3404.3')
224	aphyric basalt	348	461	10.4	3407.7	350	463	9.7	3427.9	20.2	R462-6.4 (3414.4')
225	aphyric basalt	350	463	9.7	3427.9	351	465	5.0	3442.9	15.0	R464-4.2 (3432.6')
226	aphyric basalt	351	465	5.0	3442.9	352	466	0.3	3448.2	5.3	R465-7.7 (3445.6'), R465-9.0 (3446.9')
227	aphyric basalt	352	466	0.3	3448.2	354	467	5.9	3463.3	15.1	


DEPTH
(M) (FT)
LITHOLOGY
Box #'s
Archive Box#'s
Core Run #'s
not cored
moderately plagioclase-olivine phyric basalt
sparsely to moderately plagioclase-olivine phyric basalt
3 - calcareous sediment (coral rudstone)
4 - calcareous sediment
5 - coral
calcareous sediment (matrix to clast supported)
7 - matrix supported calcareous sediment
calcareous sediment
calcareous sediment
calcareous sediment (clast -supported)
Age ca. 10 Ka, based on sea level curve
moderately to highly olivine phyric basalt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12 - lithic to vitric volcaniclastic silt (with coral and shell fragments)
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18 - fine-grained highly weathered volcanic ash
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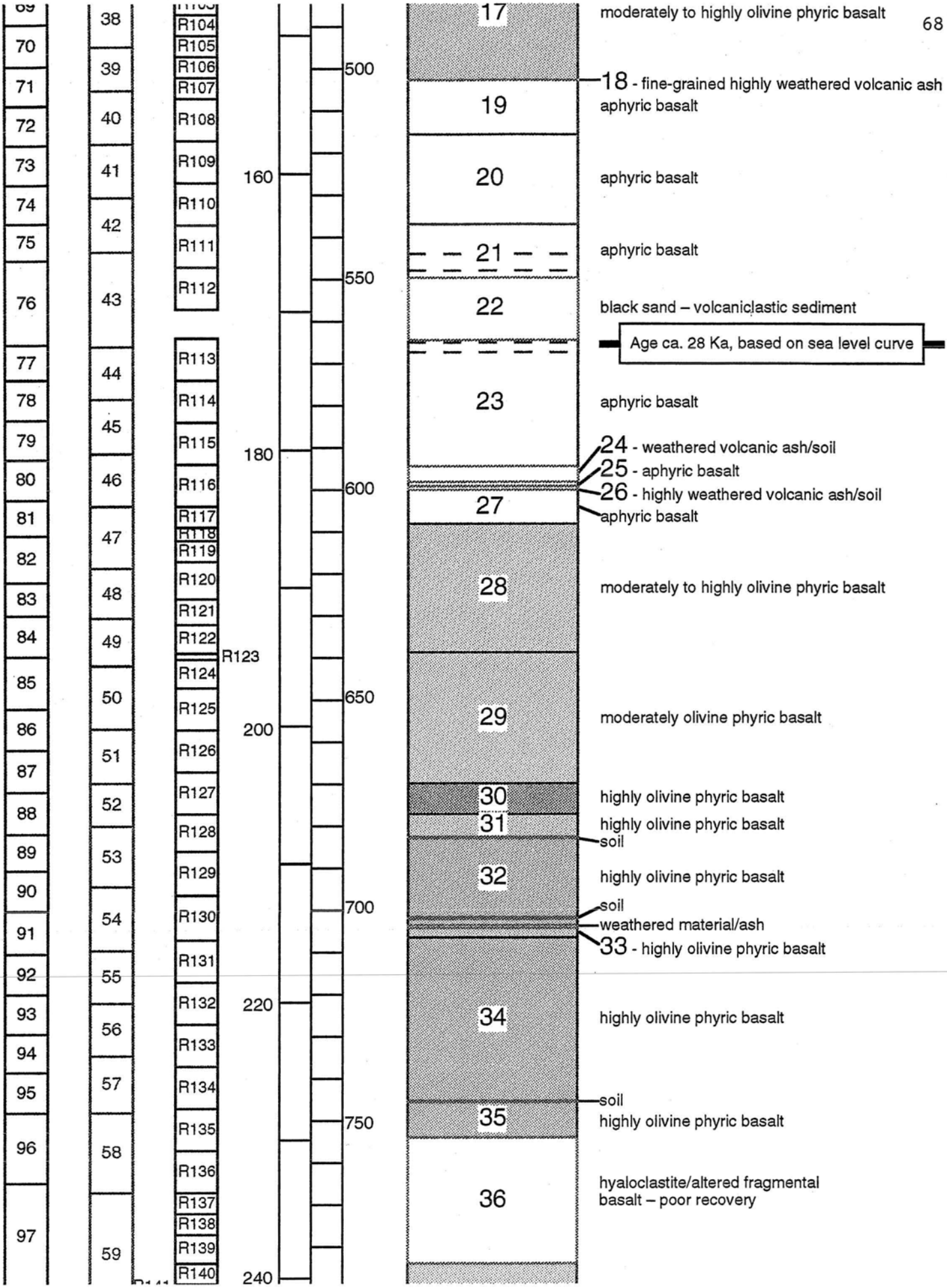
20
moderately to highly olivine phyric basalt
moderately to highly olivine phyric basalt
moderately to highly olivine phyric basalt
moderately to highly olivine phyric basalt
highly olivine phyric basalt
moderately to highly olivine phyric basalt
aphyric basalt


17
moderately to highly olivine phyric basalt
18 - fine-grained highly weathered volcanic ash
19
aphyric basalt
20
aphyric basalt
21
aphyric basalt
22
black sand – volcaniclastic sediment
Age ca. 28 Ka, based on sea level curve
23
aphyric basalt
24 - weathered volcanic ash/soil
25 - aphyric basalt
26 - highly weathered volcanic ash/soil
27
aphyric basalt
28
moderately to highly olivine phyric basalt
29
moderately olivine phyric basalt
30
highly olivine phyric basalt
31
highly olivine phyric basalt
soil
32
highly olivine phyric basalt
soil
weathered material/ash
33 - highly olivine phyric basalt
34
highly olivine phyric basalt
soil
35
highly olivine phyric basalt
36
hyaloclastite/altered fragmental basalt – poor recovery
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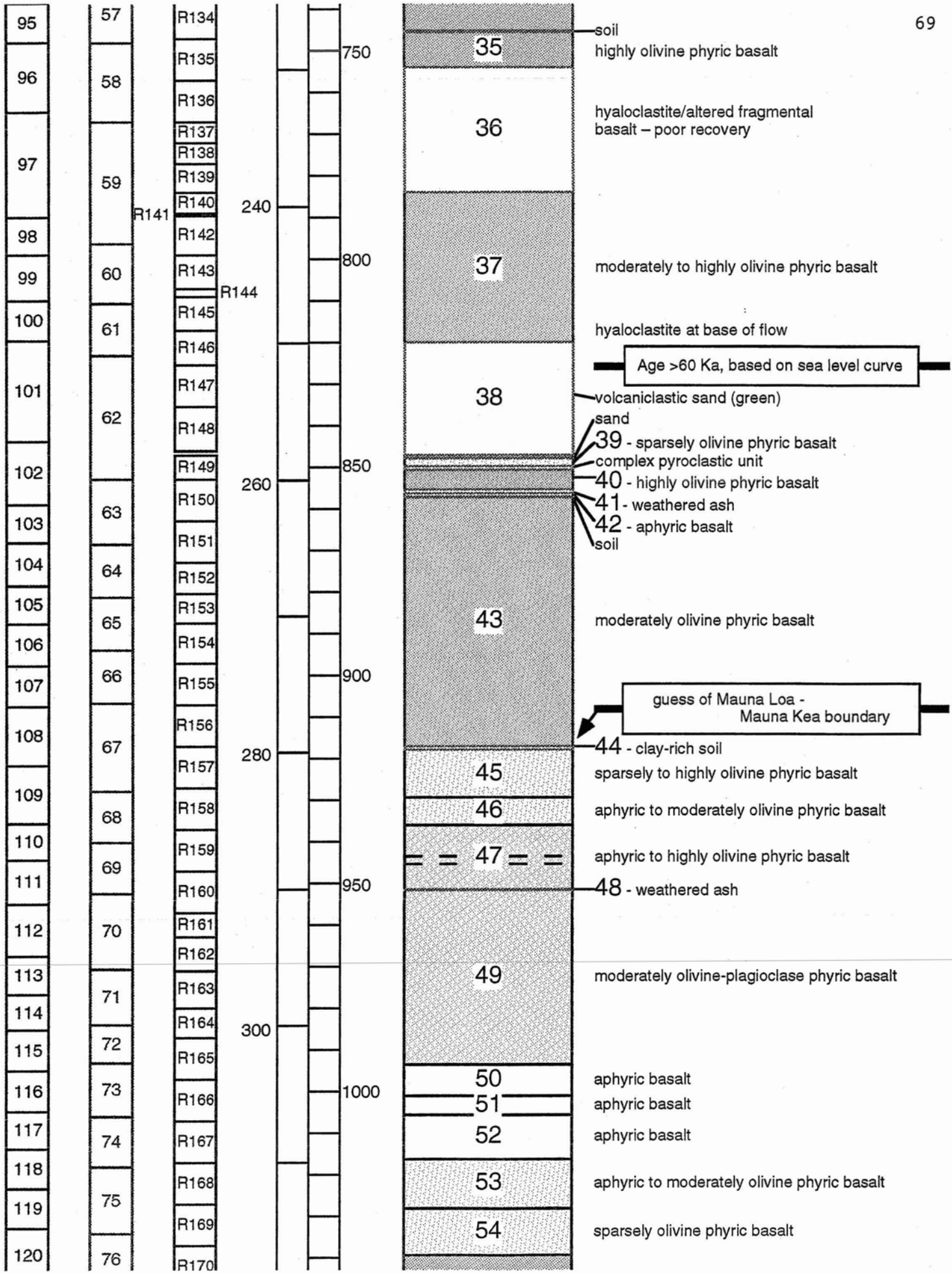
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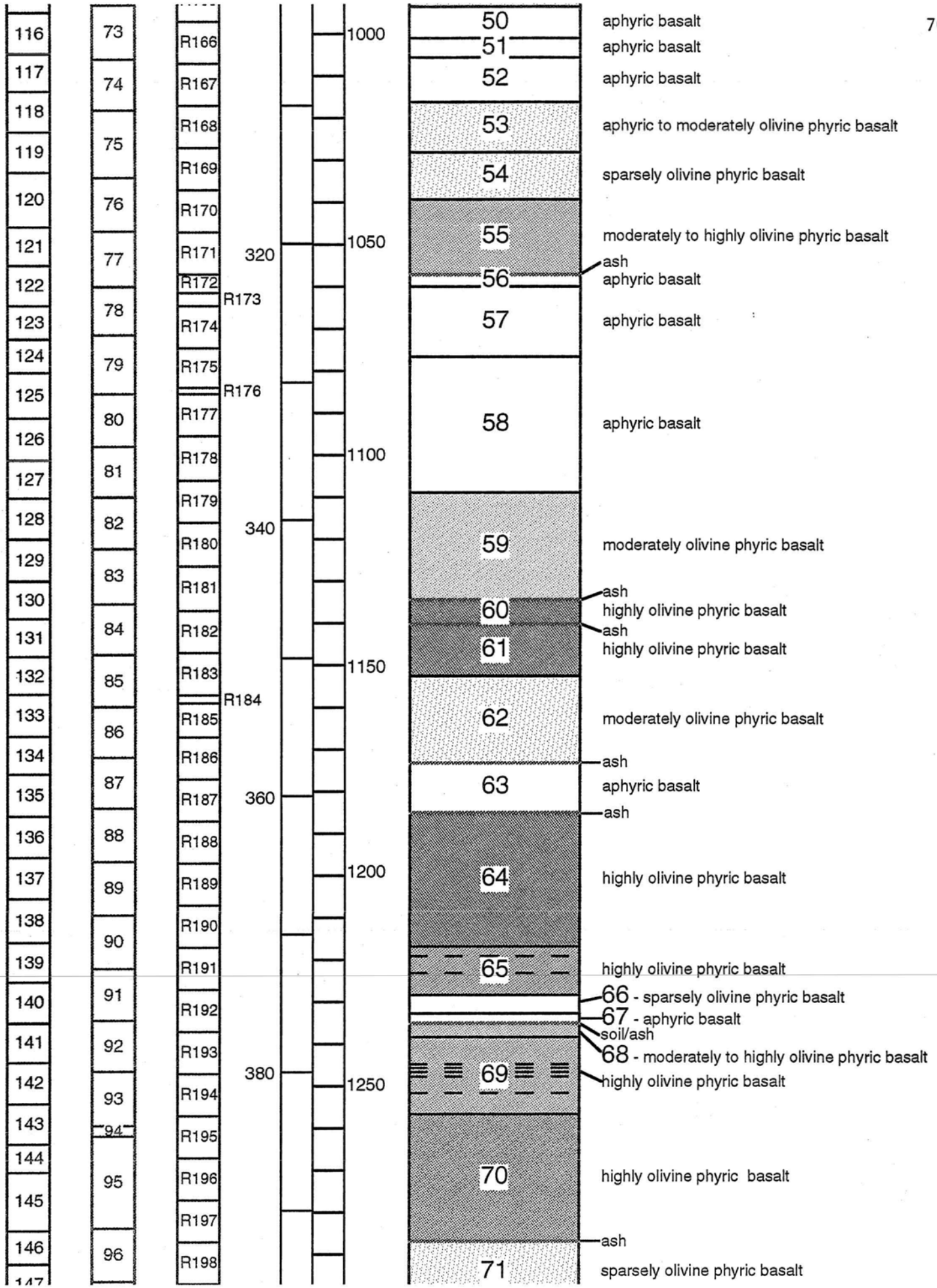
soil
highly olivine phyric basalt
hyaloclastite/altered fragmental basalt – poor recovery
moderately to highly olivine phyric basalt
hyaloclastite at base of flow
Age >60 Ka, based on sea level curve
volcaniclastic sand (green)
sand
39 - sparsely olivine phyric basalt
complex pyroclastic unit
40 - highly olivine phyric basalt
41 - weathered ash
42 - aphyric basalt
soil
moderately olivine phyric basalt
guess of Mauna Loa - Mauna Kea boundary
44 - clay-rich soil
sparsely to highly olivine phyric basalt
aphyric to moderately olivine phyric basalt
aphyric to highly olivine phyric basalt
48 - weathered ash
moderately olivine-plagioclase phyric basalt
aphyric basalt
aphyric basalt
aphyric basalt
aphyric to moderately olivine phyric basalt
sparsely olivine phyric basalt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aphyric basalt
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aphyric to moderately olivine phyric basalt
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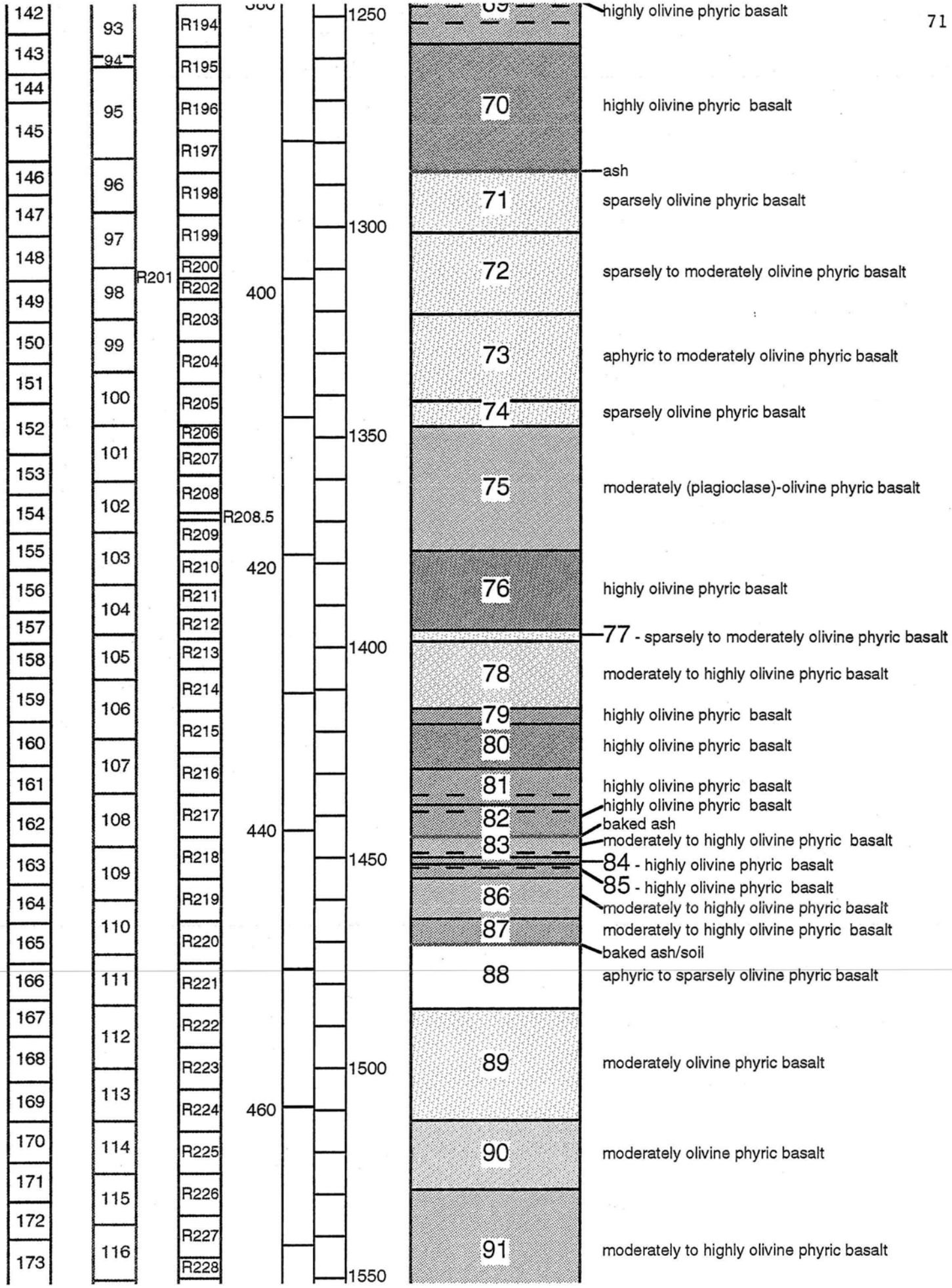
ash
highly olivine phyric basalt
moderately olivine phyric basalt
ash
aphyric basalt
ash
highly olivine phyric basalt
highly olivine phyric basalt
66 - sparsely olivine phyric basalt
67 - aphyric basalt
soil/ash
68 - moderately to highly olivine phyric basalt
highly olivine phyric basalt
highly olivine phyric basalt
ash
sparsely olivine phyric basalt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highly olivine phyric basalt
ash
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sparsely olivine phyric basalt
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sparsely to moderately olivine phyric basalt
73
aphyric to moderately olivine phyric basalt
74
sparsely olivine phyric basalt
75
moderately (plagioclase)-olivine phyric basalt
76
highly olivine phyric basalt
77 - sparsely to moderately olivine phyric basalt
78
moderately to highly olivine phyric basalt
79
highly olivine phyric basalt
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highly olivine phyric basalt
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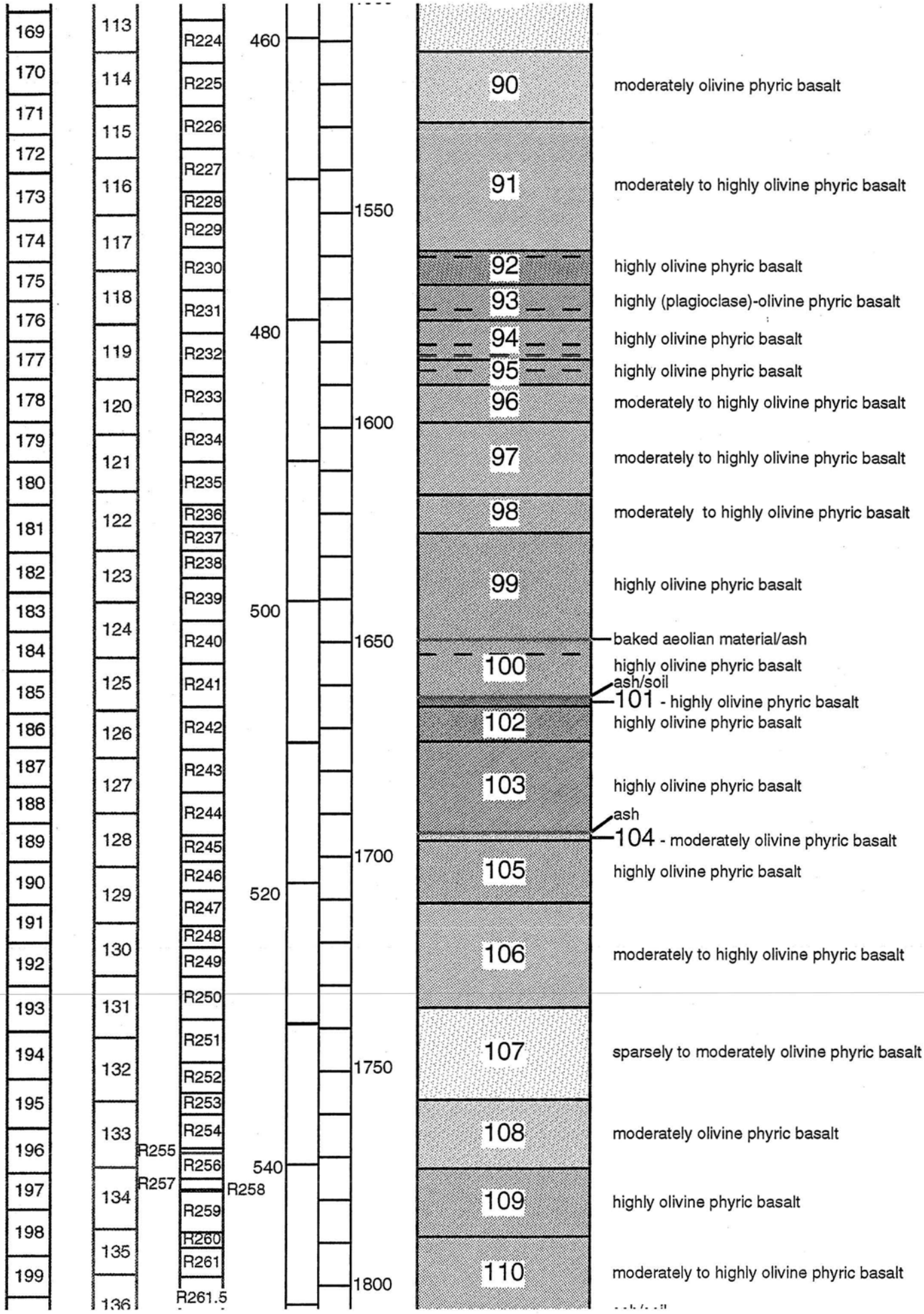
highly olivine phyric basalt
82
highly olivine phyric basalt
baked ash
83
moderately to highly olivine phyric basalt
84 - highly olivine phyric basalt
85 - highly olivine phyric basalt
86
moderately to highly olivine phyric basalt
87
moderately to highly olivine phyric basalt
baked ash/soil
88
aphyric to sparsely olivine phyric basalt
89
moderately olivine phyric basalt
90
moderately olivine phyric basalt
91
moderately to highly olivine phyric basalt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moderately olivine phyric basalt
moderately to highly olivine phyric basalt
highly olivine phyric basalt
highly (plagioclase)-olivine phyric basalt
highly olivine phyric basalt
highly olivine phyric basalt
moderately to highly olivine phyric basalt
moderately to highly olivine phyric basalt
moderately to highly olivine phyric basalt
highly olivine phyric basalt
baked aeolian material/ash
highly olivine phyric basalt
ash/soil
- highly olivine phyric basalt
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highly olivine phyric basalt
ash
- moderately olivine phyric basalt
highly olivine phyric basalt
moderately to highly olivine phyric basalt
sparsely to moderately olivine phyric basalt
moderately olivine phyric basalt
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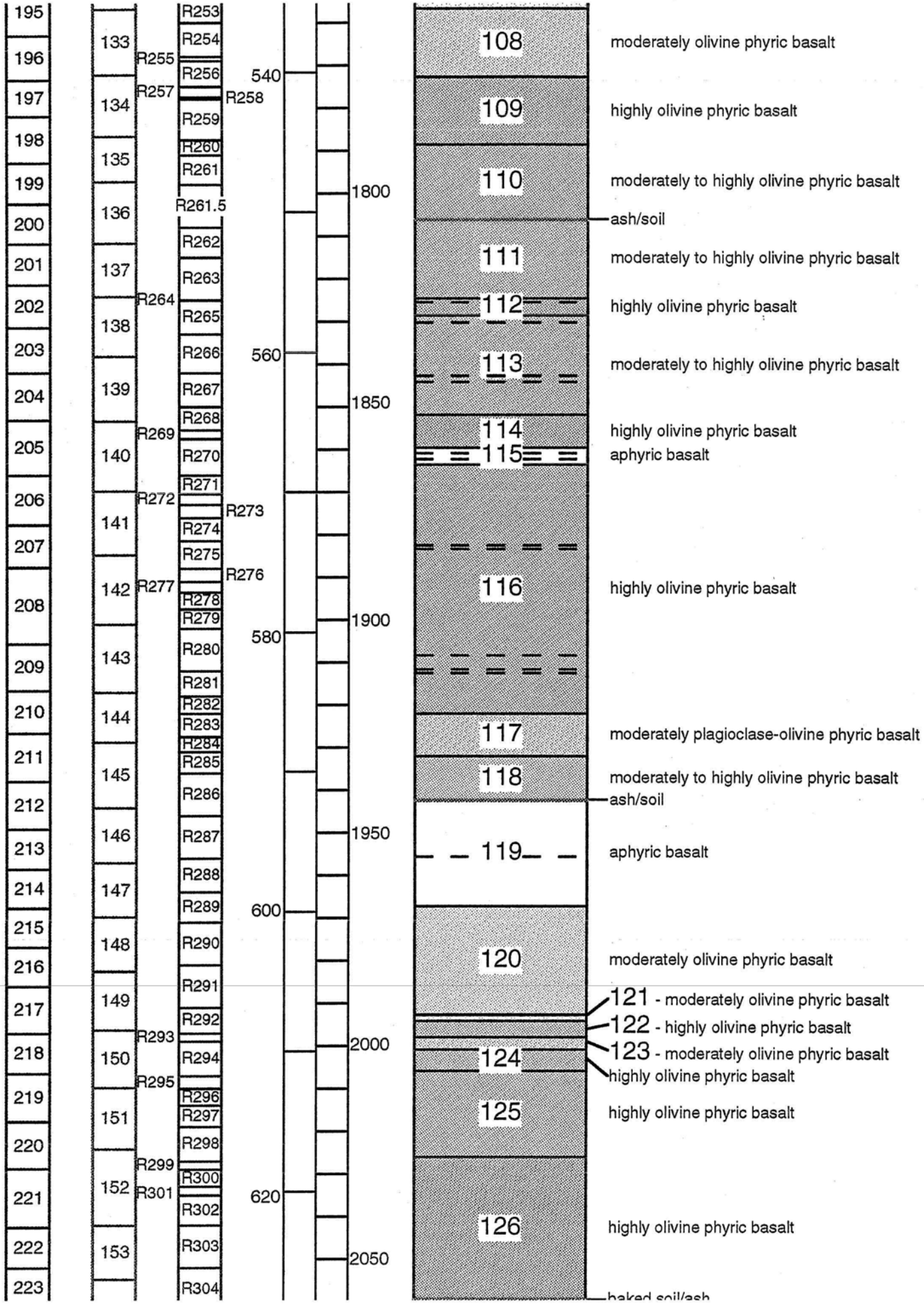
moderately to highly olivine phyric basalt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highly olivine phyric basalt
moderately to highly olivine phyric basalt
ash/soil
moderately to highly olivine phyric basalt
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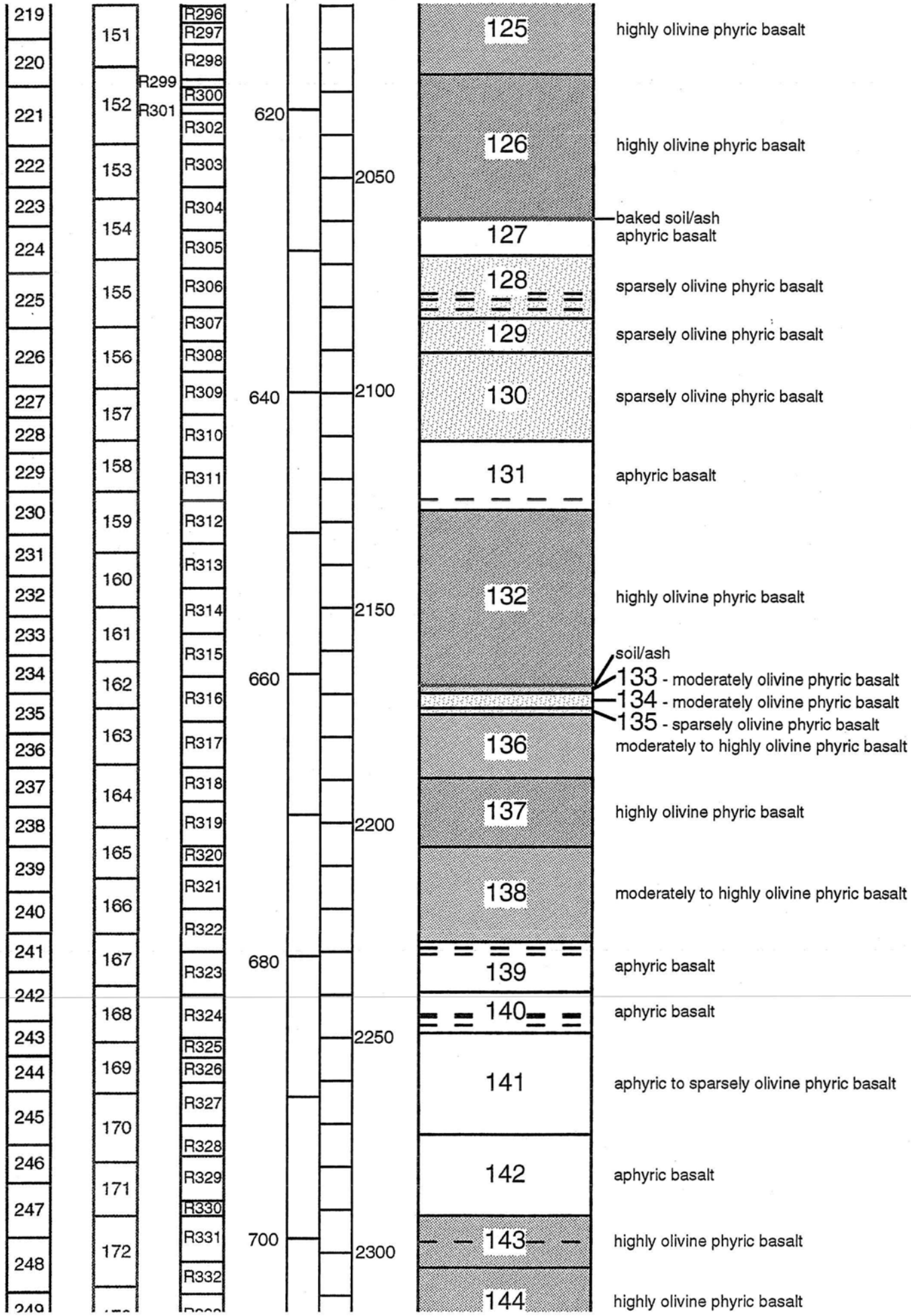
aphyric basalt
highly olivine phyric basalt
moderately plagioclase-olivine phyric basalt
moderately to highly olivine phyric basalt
ash/soil
aphyric basalt
moderately olivine phyric basalt
121 - moderately olivine phyric basalt
122 - highly olivine phyric basalt
123 - moderately olivine phyric basalt
highly olivine phyric basalt
highly olivine phyric basalt
highly olivine phyric basalt
baked soil/ash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highly olivine phyric basalt
highly olivine phyric basalt
baked soil/ash
aphyric basalt
sparsely olivine phyric basalt
sparsely olivine phyric basalt
sparsely olivine phyric basalt
aphyric basalt
highly olivine phyric basalt
soil/ash
133 - moderately olivine phyric basalt
134 - moderately olivine phyric basalt
135 - sparsely olivine phyric basalt
moderately to highly olivine phyric basalt
highly olivine phyric basalt
moderately to highly olivine phyric basalt
aphyric basalt
aphyric basalt
aphyric to sparsely olivine phyric basalt
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highly olivine phyric basalt
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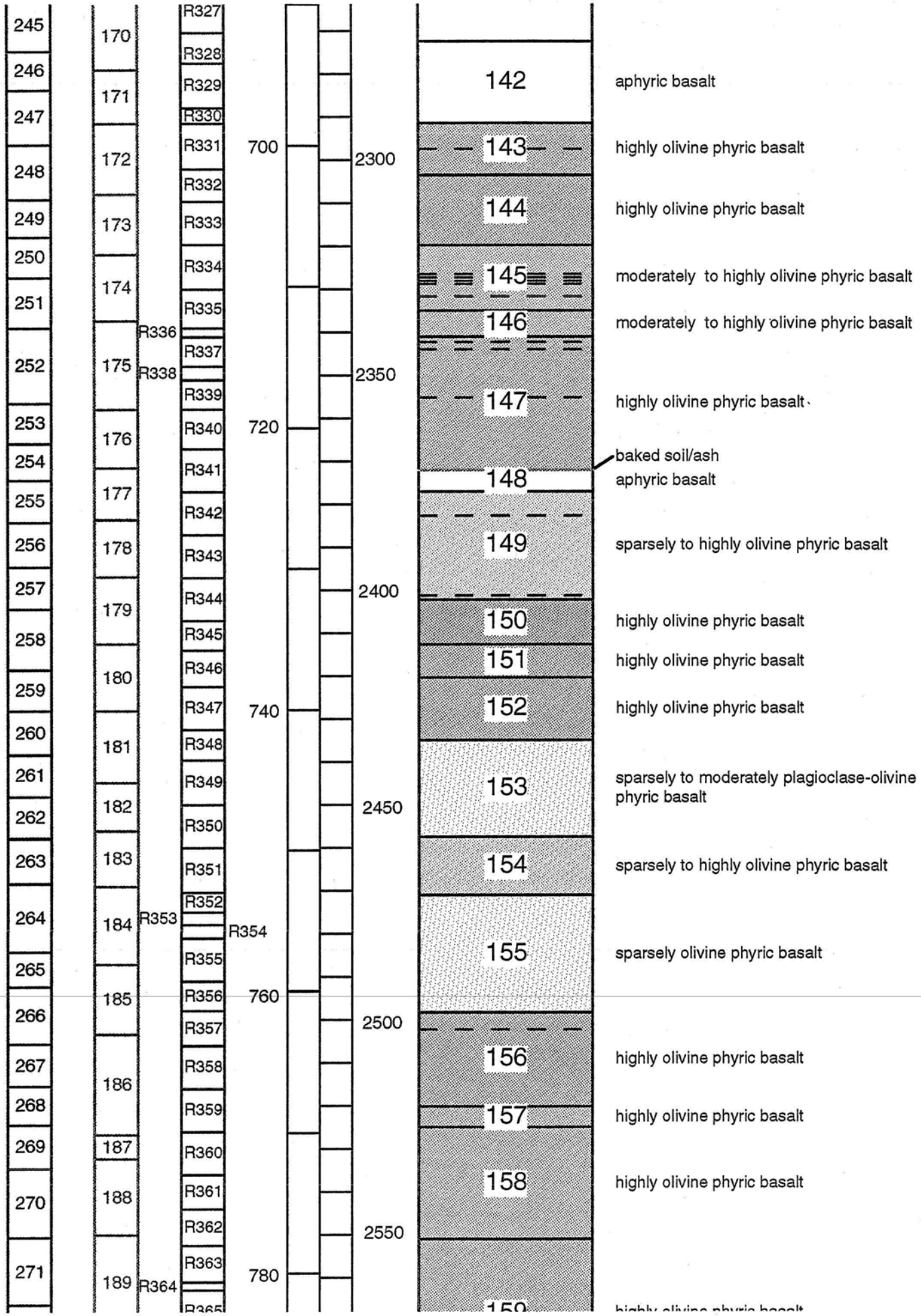
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aphyric basalt
highly olivine phyric basalt
highly olivine phyric basalt
moderately to highly olivine phyric basalt
moderately to highly olivine phyric basalt
highly olivine phyric basalt
baked soil/ash
aphyric basalt
sparsely to highly olivine phyric basalt
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sparsely to moderately plagioclase-olivine phyric basalt
sparsely to highly olivine phyric basalt
sparsely olivine phyric basalt
highly olivine phyric basalt
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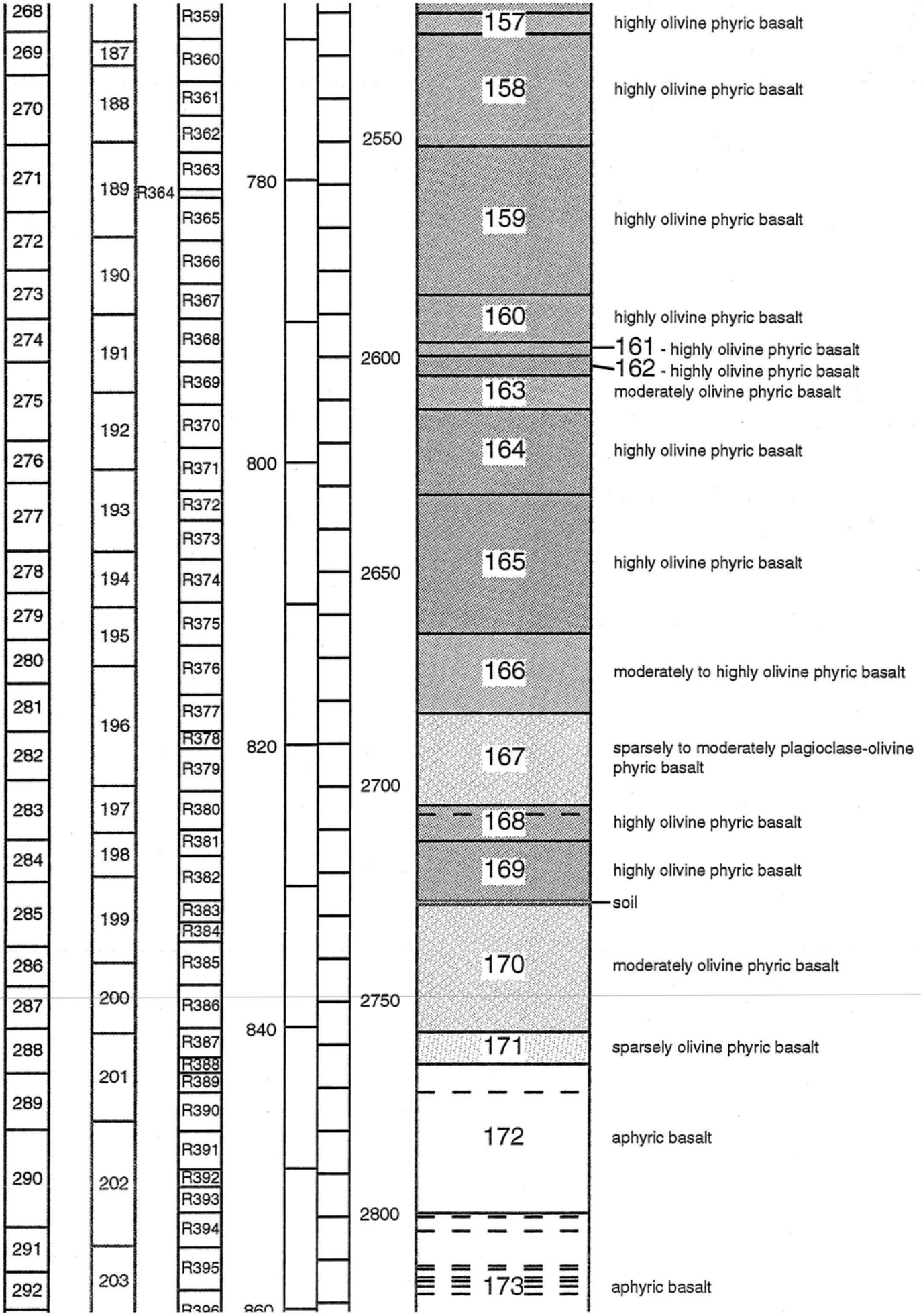
highly olivine phyric basalt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highly olivine phyric basalt
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moderately olivine phyric basalt
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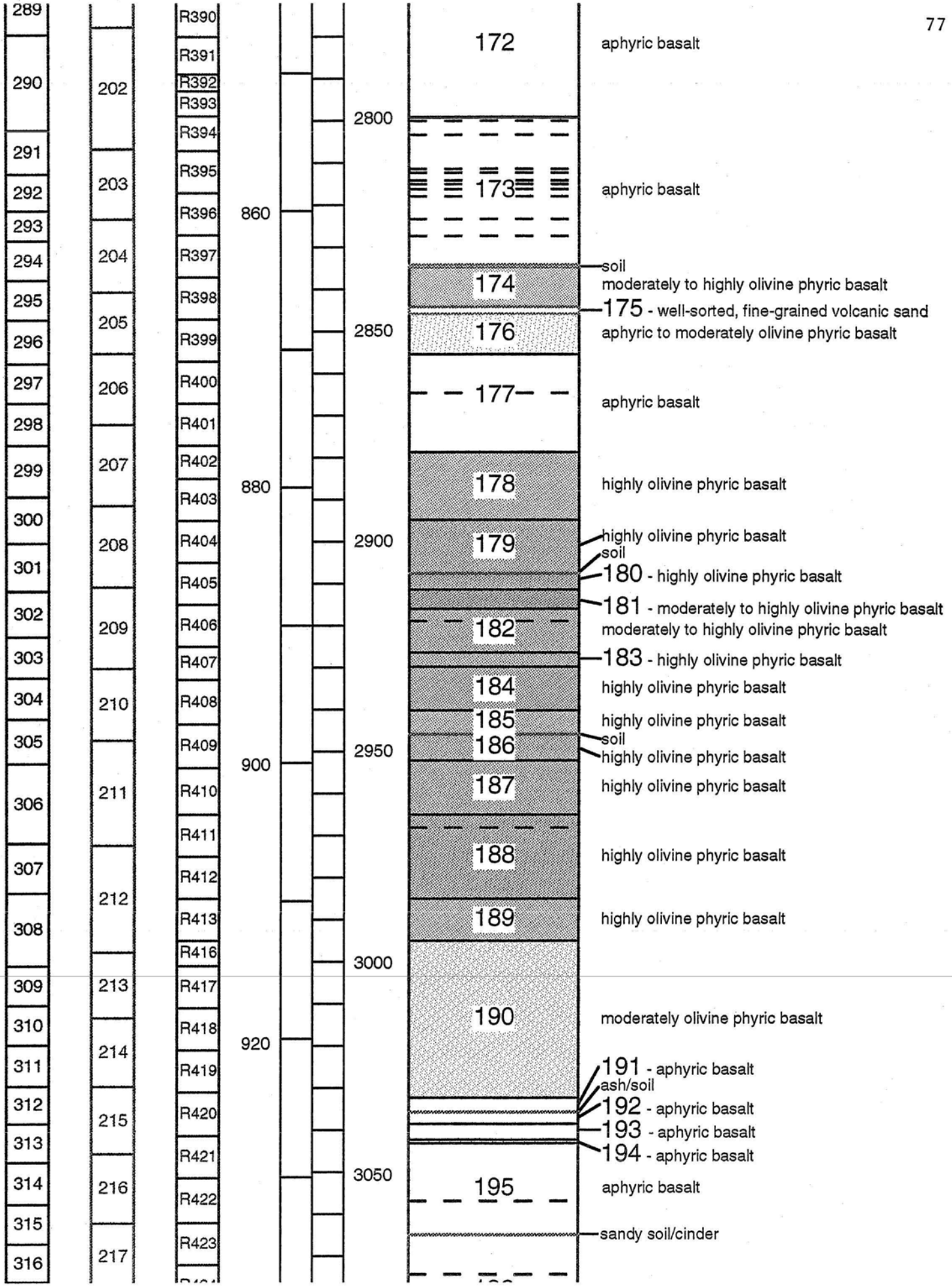
moderately to highly olivine phyric basalt
sparsely to moderately plagioclase-olivine phyric basalt
highly olivine phyric basalt
highly olivine phyric basalt
soil
moderately olivine phyric basalt
sparsely olivine phyric basalt
aphyric basalt
aphyric basalt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aphyric basalt
173
aphyric basalt
soil
174
moderately to highly olivine phyric basalt
175 - well-sorted, fine-grained volcanic sand
176
aphyric to moderately olivine phyric basalt
177
aphyric basalt
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highly olivine phyric basalt
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highly olivine phyric basalt
soil
180 - highly olivine phyric basalt
181 - moderately to highly olivine phyric basalt
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moderately to highly olivine phyric basalt
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highly olivine phyric basalt
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highly olivine phyric basalt
soil
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highly olivine phyric basalt
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highly olivine phyric basalt
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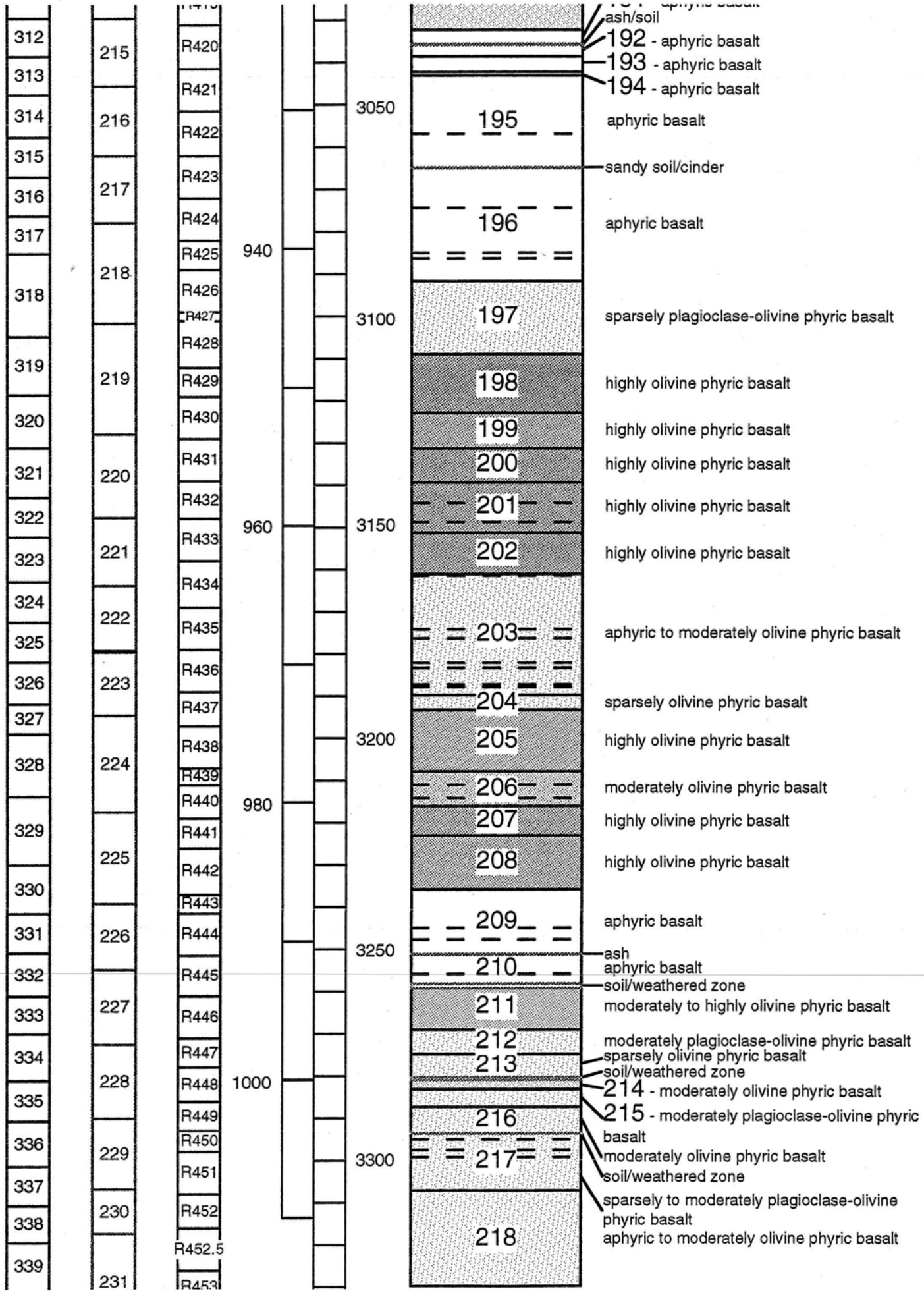
highly olivine phyric basalt
190
moderately olivine phyric basalt
191 - aphyric basalt
ash/soil
192 - aphyric basalt
193 - aphyric basalt
194 - aphyric basalt
195
aphyric basalt
sandy soil/cinder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ash/soil
192 - aphyric basalt
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aphyric basalt
sandy soil/cinder
196
aphyric basalt
197
sparsely plagioclase-olivine phyric basalt
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aphyric to moderately olivine phyric basalt
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sparsely olivine phyric basalt
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moderately olivine phyric basalt
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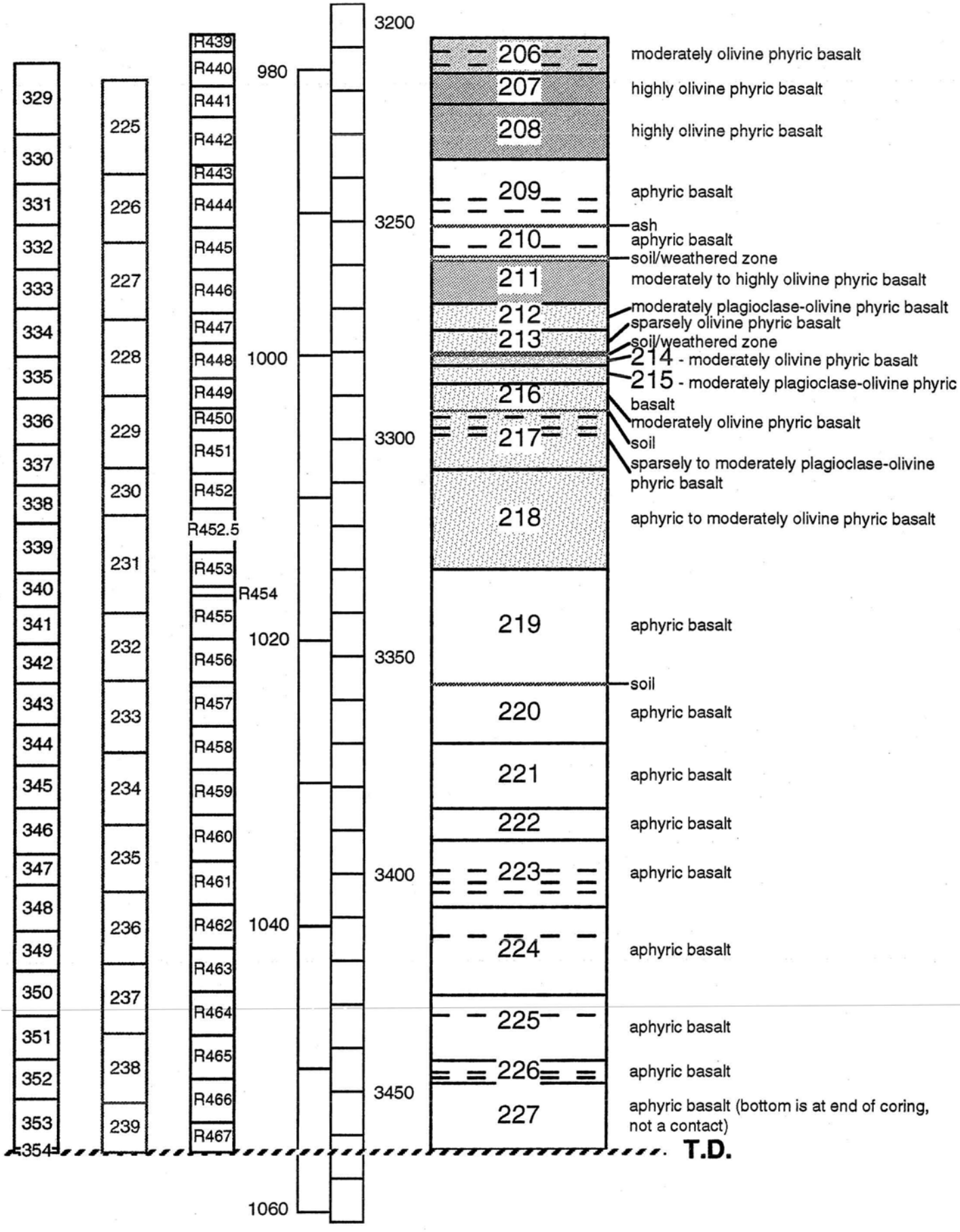
highly olivine phyric basalt
209
aphyric basalt
ash
210
aphyric basalt
soil/weathered zone
211
moderately to highly olivine phyric basalt
212
moderately plagioclase-olivine phyric basalt
213
sparsely olivine phyric basalt
soil/weathered zone
214 - moderately olivine phyric basalt
215 - moderately plagioclase-olivine phyric basalt
216
moderately olivine phyric basalt
soil/weathered zone
217
sparsely to moderately plagioclase-olivine phyric basalt
218
aphyric to moderately olivine phyric basalt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T.D.
moderately olivine phyric basalt
highly olivine phyric basalt
highly olivine phyric basalt
aphyric basalt
ash
aphyric basalt
soil/weathered zone
moderately to highly olivine phyric basalt
moderately plagioclase-olivine phyric basalt
sparsely olivine phyric basalt
soil/weathered zone
214 - moderately olivine phyric basalt
215 - moderately plagioclase-olivine phyric basalt
moderately olivine phyric basalt
soil
sparsely to moderately plagioclase-olivine phyric basalt
aphyric to moderately olivine phyric basalt
aphyric basalt
soil
aphyric basalt
aphyric basalt
aphyric basalt
aphyric basalt
aphyric basalt
aphyric basalt
aphyric basalt
aphyric basalt (bottom is at end of coring, not a contact)

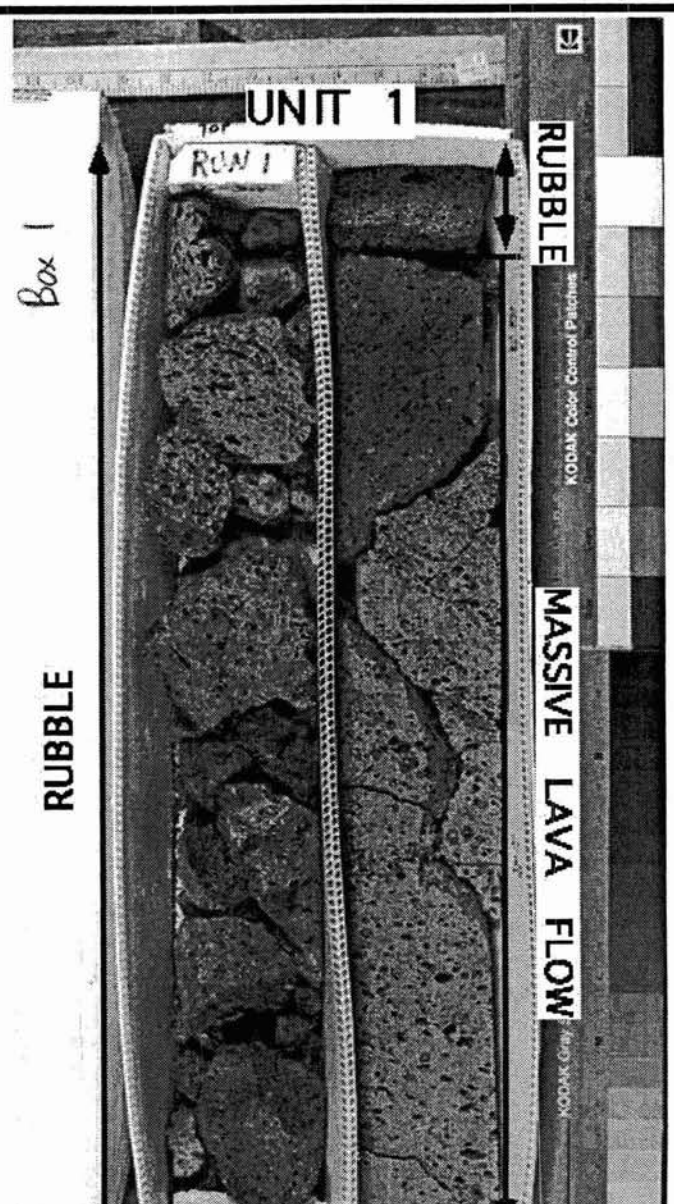
Box #:	Cores in box
1	1

Loggers:	BM, MBB, MG
Date logged:	10/29/93
Checked by:	MG
Check date:	10/29/93

Driller's depth:top [feet]:	26.0
Driller's depth:bottom [feet]:	29.6
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:1**

Contacts: Top (ft): (R 1-0.0-26.0')(surface flow?)
Bottom (ft): (R--')(continuous with next box)
This is likely the same flow exposed at the surface at the drilling site.
Unit type: transitional
surfaces of caved rubble have fluid/ropy textures; massive portion unknown
Phenocrysts/Clasts:
moderately phyric (2-10%) – homogeneous distribution throughout massive lava portion
olivine – 1% – 2-3 mm – –
Spinel inclusions in olivine. Equant to blocky. Smaller crystals (1-2 mm) are equant, larger crystals (4-7 mm) have 2:1:1 length ratio.
plagioclase – 1-2% – 1 mm – lath-shaped –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 3-4 mm – rounded – equant to elongate–
Variation in vesicle size: 1-15 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 4/2' in massive lava unit; random orientation. Occasional coatings of Fe-oxide present.
Additional comments:



Box #:	Cores in box
2	1 2

Loggers:	JCL, HJY, MG
Date logged:	10/29/93
Checked by:	MG
Check date:	10/29/93

Driller's depth:top [feet]:	29.6
Driller's depth:bottom [feet]:	32.2
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:1**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
1.4 ft. of cave from beginning of run 2.

Unit type: massive
gradational with transitional flow from box 1.

Phenocrysts/Clasts:
moderately phyric (2-10%) – 300 points counted for modes
olivine – 1-3% – 2.5 mm – equant –
range: < 1-5 mm, some are rounded (?)
plagioclase – <1% – 1 mm – lath-shaped –
range: < 1-1.5 mm
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) – coarser but gradational with above

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

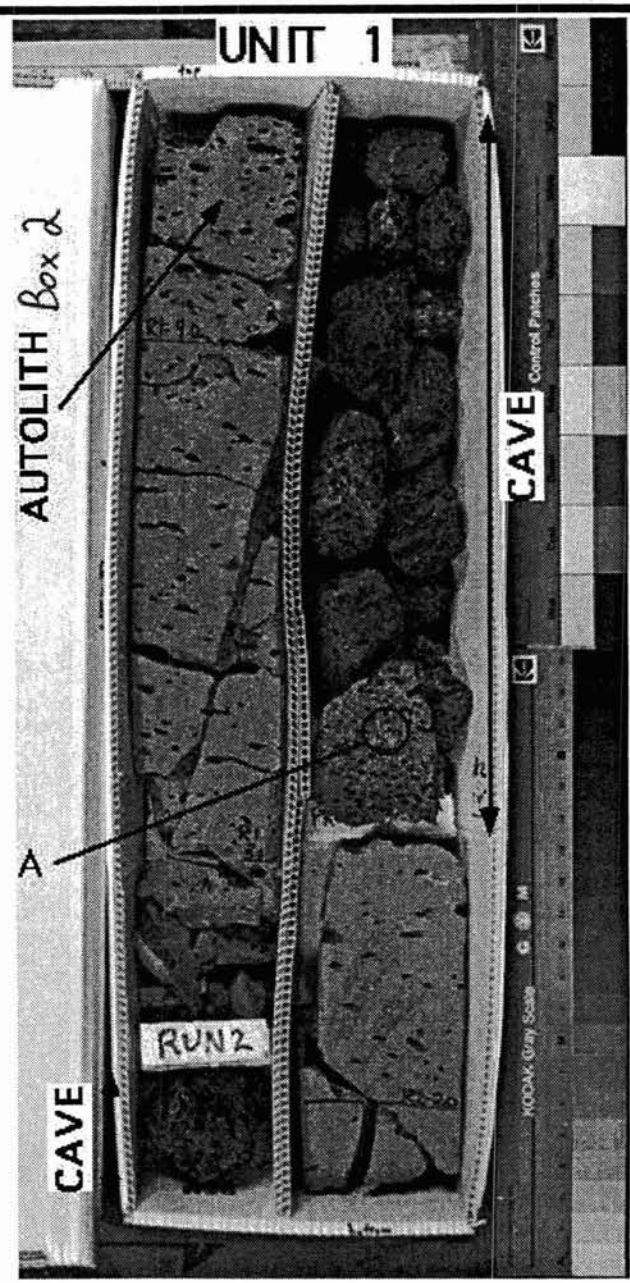
Vesicles: 5-15% – 8 mm – horizontally elongate – 3:1–
small plagioclase laths line the vesicles
upper portion: 10-15%, lower portion: 5-10%

Alteration: fresh (<2% altered) – iron oxide
concentrated along fractures and some vesicles

Veins: none

Fractures: moderately fractured: ~7/1.5 ft

Additional comments:
Object "A" is a 15 mm, open-textured gabbroic inclusion
~2 cm subangular clast of darker, more highly vesicular material (autolith of flow crust?). Core at the end of run 1 appears to be continuous with core in run 2 below the 1.4 ft of caved material at the top of run 2.



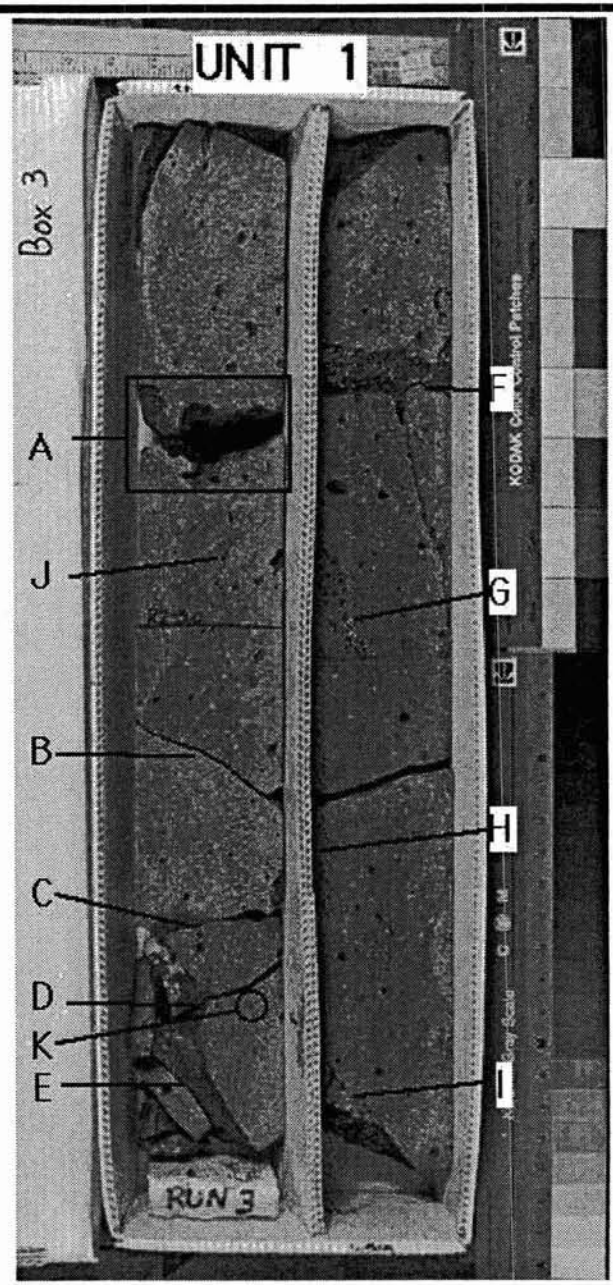
Box #:	Cores in box
3	2 3

Loggers:	BM, MBB, MG
Date logged:	10/29/93
Checked by:	MG
Check date:	10/30/93

Driller's depth:top [feet]:	32.2
Driller's depth:bottom [feet]:	33.9
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:1**

Contacts: Top (ft): (R --')(continuous with previous core run)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) – homogeneous distribution
olivine – 2-3% – 3-4 mm – see below –
spinel inclusions; larger phenocrysts are blocky; smaller phenocrysts are equant
plagioclase – 1-2% – 1-2 mm – tabular –
– – – –
Groundmass/Matrix: microcrystalline – diktytaxitic
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – rounded to subangular – equant to slightly elongate –
Two populations, group noted above and a smaller diameter population (≤1 mm) comprising ~10%. "A"=segregation vesicle, infilling contains small, abundant vesicles and has more coarsely crystalline plagioclase crystals in the groundmass; "G"&"J"=deformed vesicles; "G", "H" and "I"=pipe vesicles, minimum diameter=2.5 cm, minimum length=14 cm.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured. Several fractures marked on Polaroid with dips of "B"=30°, "C"=10°, "D"=15°, "E"=60°, "F"=0°; minor coating of "dirty" yellow-brown material.
Additional comments:
Feature "K" is a 6 mm diameter pyroxene-olivine crystal clot. NaCl ppt occurs on most dried surfaces.



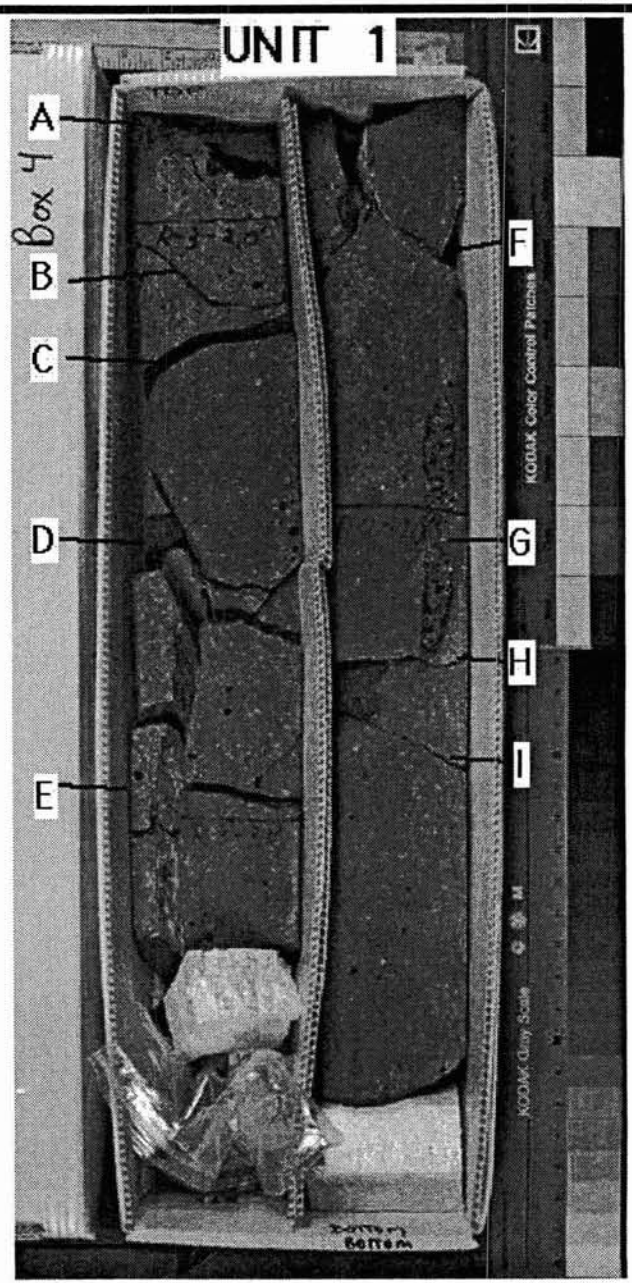
Box #:	Cores in box
4	3

Loggers:	JCL, MBB
Date logged:	10/30/93
Checked by:	MG
Check date:	10/30/93

Driller's depth:top [feet]:	33.9
Driller's depth:bottom [feet]:	37.1
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:1**

Contacts: Top (ft): (R --')(continuous with previous core run)
Bottom (ft): (R--')(continuous with next core run)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 1-3% – 2 mm – equant –
Range in size from 1-7 mm, with sub-mm microphenocrysts also present; small chrome spinel inclusions present in some of the larger olivines
plagioclase – 2-3% – 1 mm – tabular –
Size range from <1 mm to 2 mm; microphenocrysts also present
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: <1% large; 10-20% small – 1-5 mm (large); <<1 mm (small) – rounded – equant–
diktytaxitic texture
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: ~9/3.4 ft. Preferred fracture orientation is sub-horizontal. One major vertical fracture present.
Additional comments:
Photo notes: A=pipe vesicle - continuation from bottom of box 3 B=35° fracture C=15° fracture D=65° fracture E=90° fracture F=30° fracture with white coating G=pipe vesicle; more vesicular than host; contains olivine and plagioclase phenocrysts H=0° fracture I=20° fracture.
Rare, small 5-15 mm, open textured gabbroic inclusion. Not annotated on photo but labeled on box.



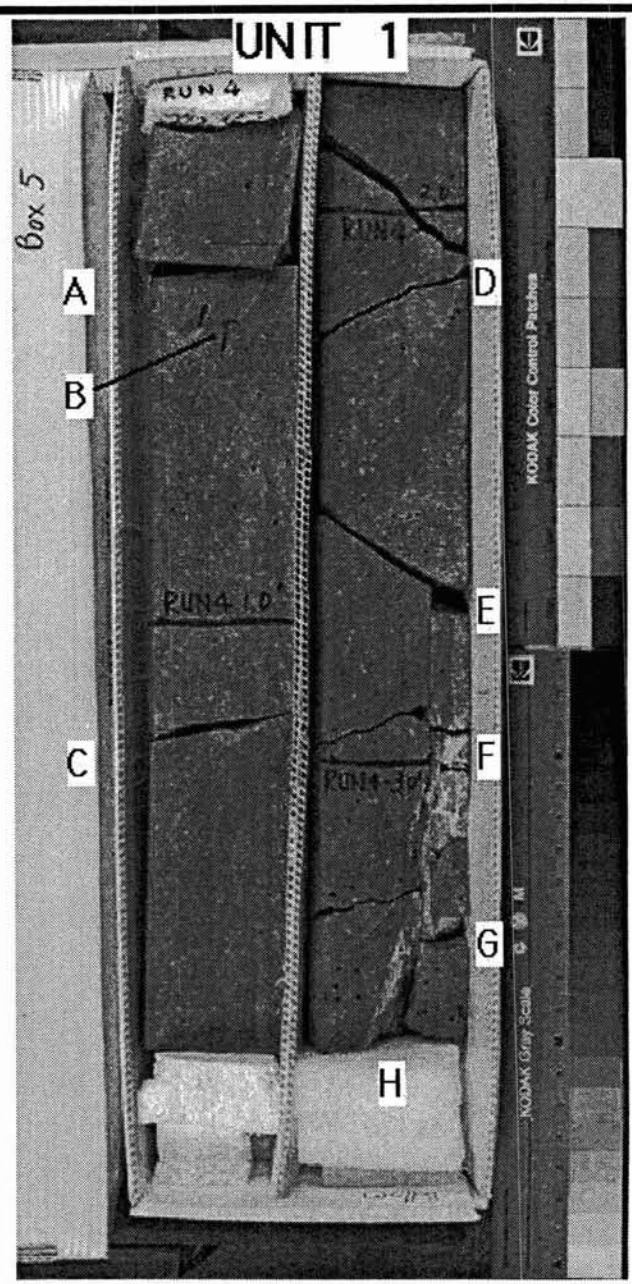
Box #:	Cores in box
5	4

Loggers:	JCL,MBB,MG
Date logged:	10/30/93
Checked by:	MG
Check date:	10/30/93

Driller's depth:top [feet]:	37.0
Driller's depth:bottom [feet]:	40.5
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:1**

Contacts: Top (ft): (R --')(continuous with previous core run)
Bottom (ft): (R--')(continuous with next core)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
plagioclase – 1-2% – 1-2 mm – tabular –
olivine – 2-3% – 2-3 mm – equant to blocky –
1-7 mm with some multi-grain clusters. Chrome spinel inclusions in some of the larger olivines.
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 1-3% large; 10-20% small – large=2 mm; small<<1mm – rounded – equant–
diktytaxitic texture
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 8/3.5 ft, 4 horizontal, 3 inclined 20-40°, 1 vertical.
Additional comments:
Thin white coating on most surfaces. A,C,F, and G-horizontal fractures partially coated with white mineral. D,E-inclined fractures with white coating. H-vertically inclined fracture with white coating. B-two vertically oriented vesicles overlying zone of vertically-oriented small vesicles. From R4-2.0 to bottom of box, small vesicles are concentrated in thin sub-horizontal lenses (inclined 10-30°). Rare, small 5-15 mm open textured gabbroic clots.



Box #:	Cores in box
6	4 5

Loggers:	MBB
Date logged:	10/30/93
Checked by:	MG
Check date:	10/30/93

Driller's depth:top [feet]:	40.5
Driller's depth:bottom [feet]:	44.0
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:1**

Contacts: Top (ft): (R --')(continuous with previous core run)
Bottom (ft): (R--')(continuous with next box)
Maybe coming to bottom of flow unit -- see comments under Unit type

Unit type: massive
Transitional at bottom of box; ropy surface textures and glassy rinds observed on some rubbly pieces at bottom of box.

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-3% – 1-3 mm – equant to blocky –
Olivine phenocrysts contain spinel inclusions; some olivines present as crystal clots.
plagioclase – 2-3% – 1-2 mm – tabular –
– – – –

Groundmass/Matrix: microcrystalline – diktytaxitic; groundmass plagioclase laths decrease in size toward bottom of box

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

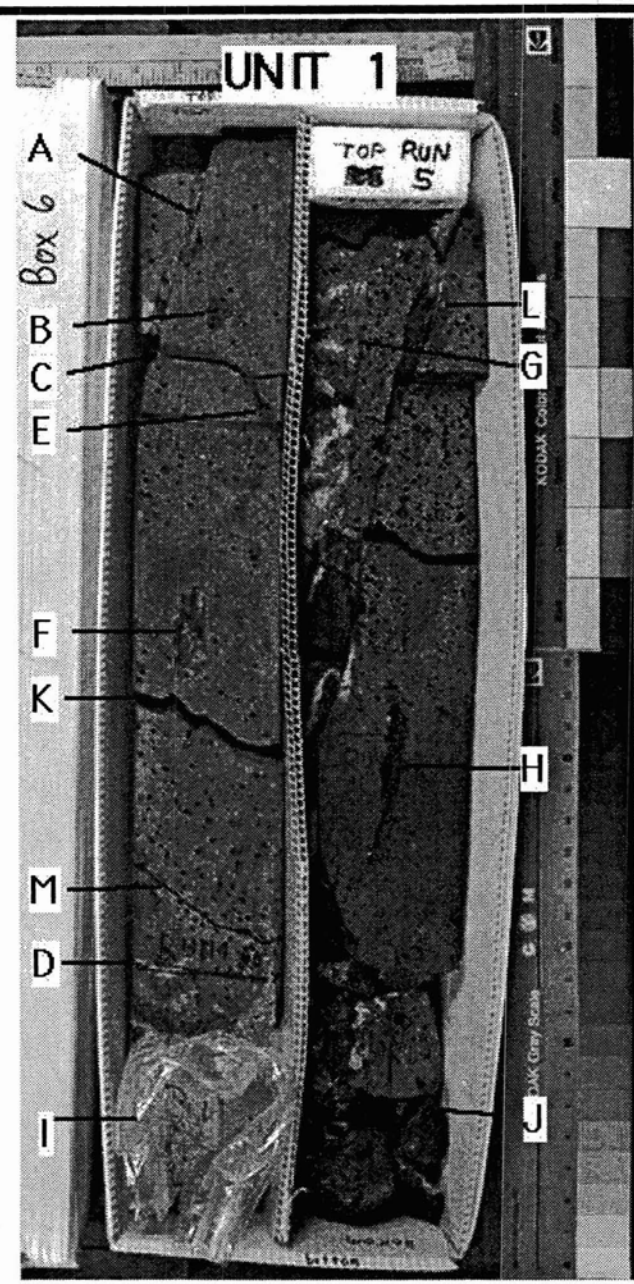
Vesicles: <5% to 5-10% – 1-5 mm – rounded – equant to elongated–
B,E,L = segregation vesicles; F = vesicle with rind of infilling melt; H = unfilled pipe vesicle; proportion of vesicles increases from <5 to 5-10% down section in the box. Small <1mm vesicles present in massive portion above run 4 - 4.0'; white fillings in region D (photo)

Alteration: fresh (<2% altered) –

Veins: none

Fractures: Weakly fractured: 10/3 ft (not counting rubbly zones I & J); several fractures marked on Polaroid with dips of A = 80°, surfaces have white coating; C = 0°; G = 85°, surfaces have white coating, associated horizontal fractures; K = 30°; M = 30°.

Additional comments:
Rare, small 3-10 mm gabbroic/crystal clot inclusions.



Box #:	Cores in box
7	5

Loggers:	JCL
Date logged:	10/30/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	44.0
Driller's depth:bottom [feet]:	47.0
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately olivine-plagioclase phyric basalt **UNIT #:1**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R5-2.8-45.2')(flow contact)
Glassy fragments and ropy textures found in zone A suggesting proximity to contact, but no distinct lithologic breaks were observed. Contact is probably between R5-2.0 and R5-3.6.

Unit type: transitional
ropy surfaces observed on some rubble fragments

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – approx. 1% – 1-2 mm – equant to blocky –
size range 1-4 mm
plagioclase – 1-2% – 1 mm – tabular –
size range 1-2 mm; microphenocrysts also present
– – – –

Groundmass/Matrix: microcrystalline to glassy –

Color: N2 grayish black – **Structures:** – **Sorting:** –

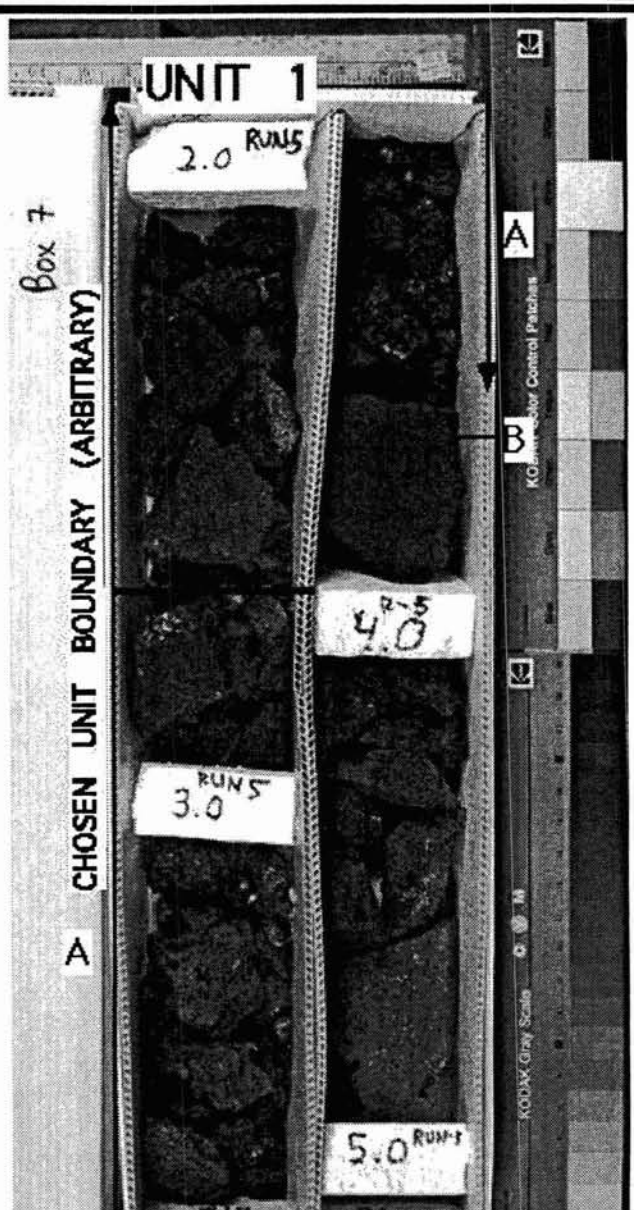
Vesicles: 20-30% – 1 mm – rounded – equant–
Size range <1 mm - 15 mm. Diktytaxitic texture less developed than in previous box.

Alteration: fresh (<2% altered) –
Some rubble surfaces have thin white to yellowish coating.

Veins: none

Fractures: rubble throughout box

Additional comments:
A-rubble containing some glassy rinds and ropy textures B-linear, probably horizontal row of vesicles (orientation uncertain due to small size of rubble). Rare inclusions of small (<1 cm) gabbroic clots present throughout box. Glassy rinds, often with ropy flow texture, present on several rubble fragments. Pipe vesicles present.



Box #:	Cores in box	
8	5	8
	6	
	7	

Loggers:	MBB
Date logged:	10/30/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	47.0
Driller's depth:bottom [feet]:	58.3
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:2**

Contacts: Top (ft): (R 5-2.8-45.2')(depositional)
Bottom (ft): (R--')(continuous with next box)
Contact is not obvious but probably occurs in the interval R5-2.0 to 3.6 in Box 7. This is a rubbly zone; see description of Box 7.

Unit type: massive
Describes material from top of box to start of run 6; mark "D" in Polaroid photo.

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-3% – 2 mm – equant to blocky –
Some olivines contain spinel inclusions; some of the olivines occur as crystal clots.
plagioclase – 1-2% – 1 mm – tabular (>3:1:1) –
– – – –

Groundmass/Matrix: microcrystalline – hint of a diktytaxitic texture

Color: N2 grayish black – **Structures:** – **Sorting:** –

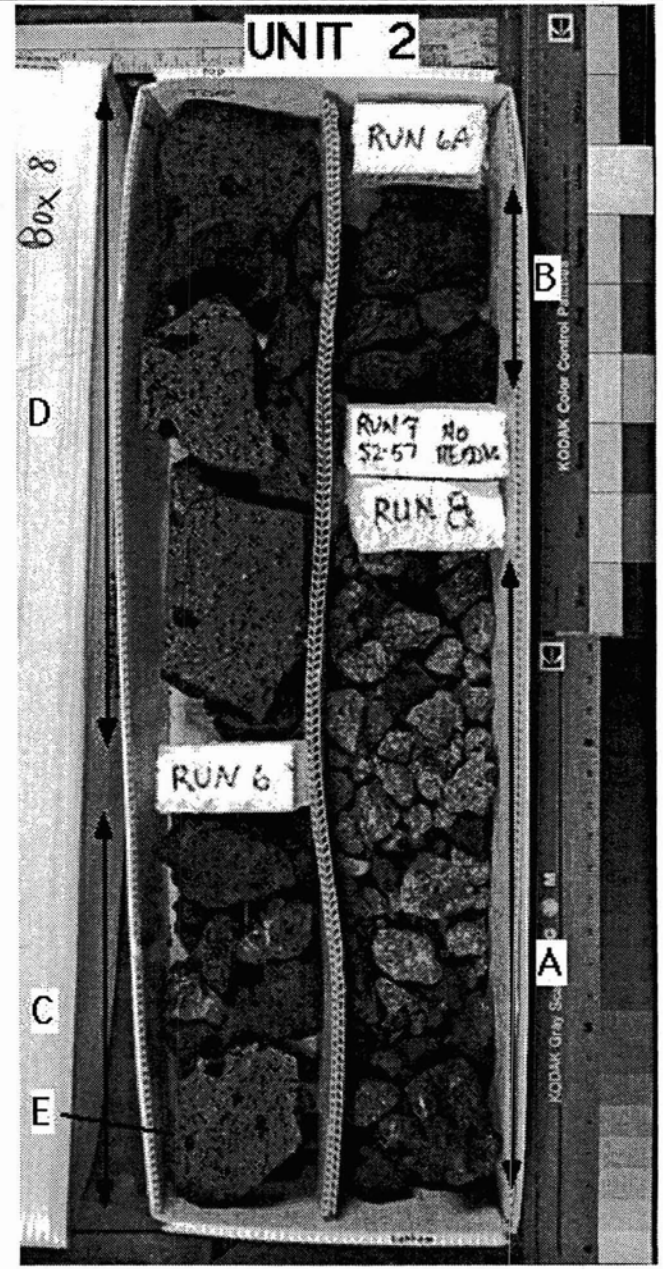
Vesicles: 10-20% total – 10-20 mm; 2-3 mm – subrounded-rounded; subangular – elongate; equant –
rare grayish-white coatings
Two populations of vesicles; above descriptions should be read straight across; pipe vesicles present.

Alteration: fresh (<2% altered) –

Veins: none

Fractures: moderately fractured: 8/1.1'. Only measured from top of box to top of run 6.

Additional comments:
See Polaroid photo: "A" = rubbly/caved material probably from 47' to 62' depth. Cement filled vesicles; material looks similar to massive material labeled "D" in photo. "B" = rubbly/caved material; some surfaces have a "glassy" appearance. "E" = similar in appearance to "D" but with a slightly higher plagioclase phenocryst content (2-4%).
Rare, small 5-15 mm, open textured gabbroic inclusion. Not annotated on photo but labeled on box.



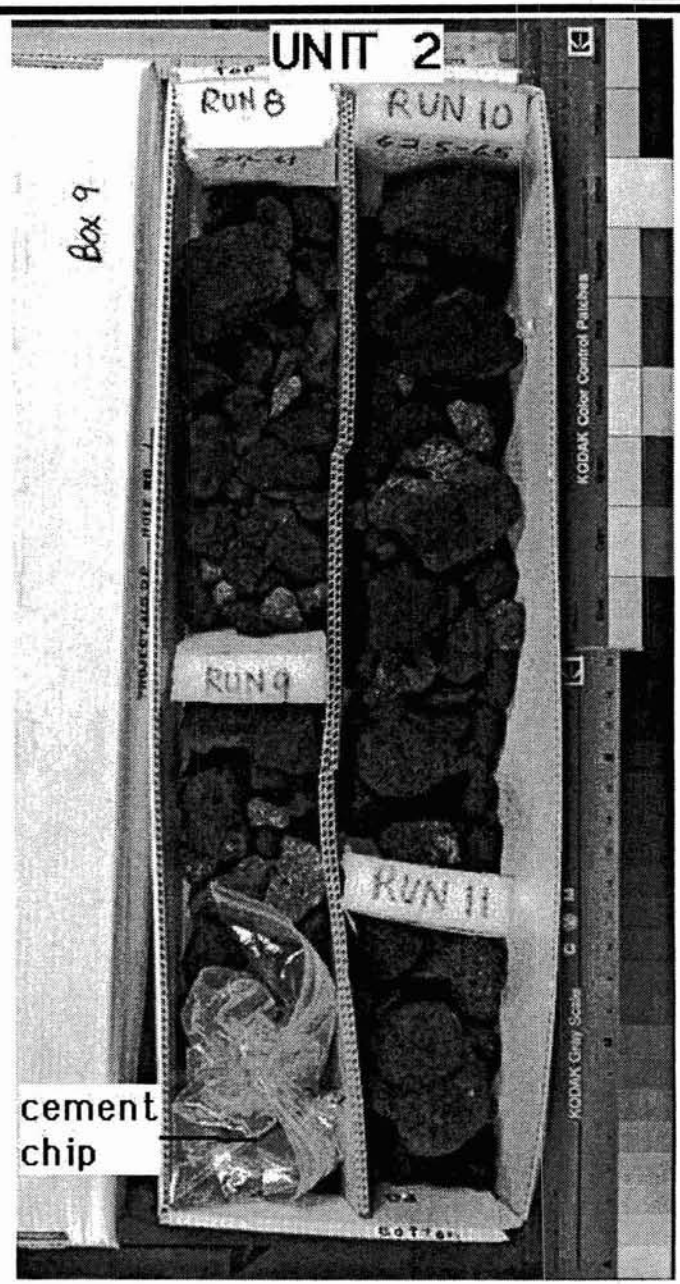
Box #:	Cores in box	
9	8	11
	9	
	10	

Loggers:	JCL
Date logged:	10/30/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	58.3
Driller's depth:bottom [feet]:	65.5
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:2**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Entire box is rubble/cave from depth interval 47-70 ft.
Unit type: rubble/cave
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 1-2% – 1-2 mm – blocky (<3:1:1) –
Size range 1-9 mm. Spinel inclusions in larger olivines.
plagioclase – 1-2% – <1 mm – tabular (>3:1:1) –
Size range <1-2 mm.
– – – –
Groundmass/Matrix: microcrystalline –
Color: N2 grayish black – **Structures:** – **Sorting:** –
Vesicles: 5-15% – 1 mm – rounded – equant–
Diktytaxitic texture. Size range <1-10 mm.
Alteration: fresh (<2% altered) –
Thin white to yellow discontinuous coating on some surfaces (Fe-sulfates?).
Veins: none
Fractures: rubble
Additional comments:
Many vesicles are infilled with cement. Rubble/cave is similar in appearance and mineralogy to core from top of box 8 (D from box 8 Polaroid); glass present on some rubble surfaces in run 10 section (1/2 way through this section).



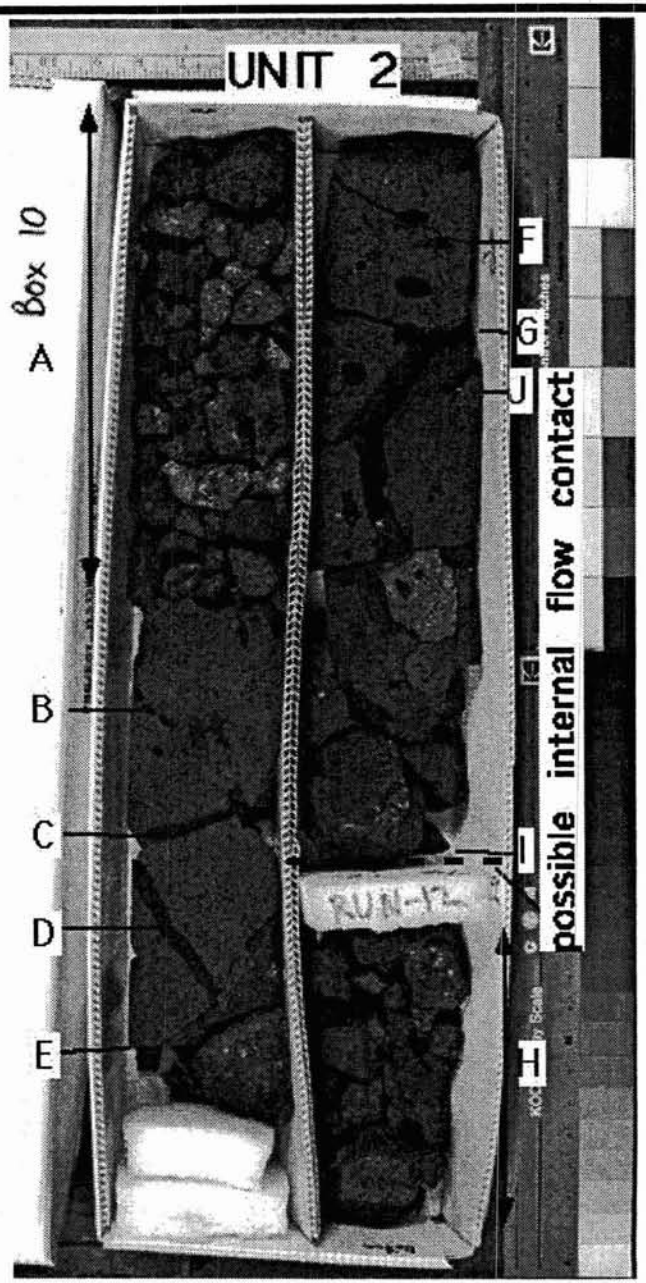
Box #:	Cores in box
10	11 12

Loggers:	JCL
Date logged:	10/30/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	65.5
Driller's depth:bottom [feet]:	70.4
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:2**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Glass rind on core at base of R11 - possible flow contact at R11-3.9.
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) – 200 points counted for modes
olivine – 1-2% – 2 mm – blocky (<3:1:1) –
Size range 1-5 mm. Spinel inclusions in larger olivines.
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
range 1-4 mm
– – – –
Groundmass/Matrix: microcrystalline –
Color: N2 grayish black – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – rounded – equant–
Several large (>1 cm) vesicles present - bimodal population.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Moderately fractured: 11/2.5 ft measured for continuous core only (excluding rubble). Thin yellow coating along some fractures.
Additional comments:
A=rubble/cave similar to material from box 9. B=chain of large pipe vesicles. C=60° fracture D=80° fracture E=40° fracture F=30° fracture G=30° fracture. H=rubble/cave-some pieces contain cement infilling vesicles, others are "clean" I=small glassy rind at base of continuous core from R11 J=small gabbroic inclusion on far side of core. Fracture filling NaCl present on dried surfaces.



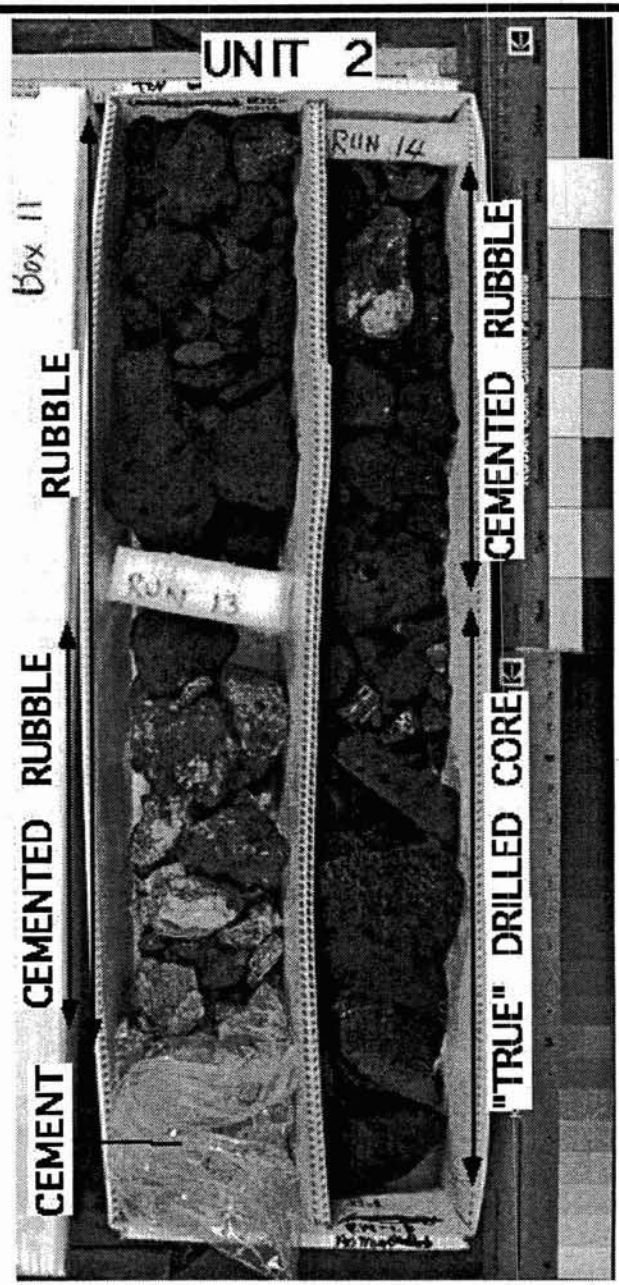
Box #:	Cores in box
11	12 13 14

Loggers:	BM, LW
Date logged:	10/30/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	70.4
Driller's depth:bottom [feet]:	74.3
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:2**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 1-2% – 1 mm – see below –
Size variance: <1 to 3 mm. Shape varies from equant small grains to tabular/blocky coarse grains.
plagioclase – <1% – <1 mm – tabular (>3:1:1) –
Size variance: <1 to 1 mm.
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – rounded – equant–
Size variance: 1-7 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Rubble throughout. Some fractures contain a creamy to yellowish set of parallel, concentric bands (4 mm apart) of $CaCO_3$.
Additional comments:
From approx. R12-0.4' to R14-1.0', the core recovery forms indicate that rubble/caved material was sampled in the core barrel. Heavily cemented core from R13 to R14-0.5'. Cement sample is contained within a plastic bag.



Box #:	Cores in box
12	14 15 16

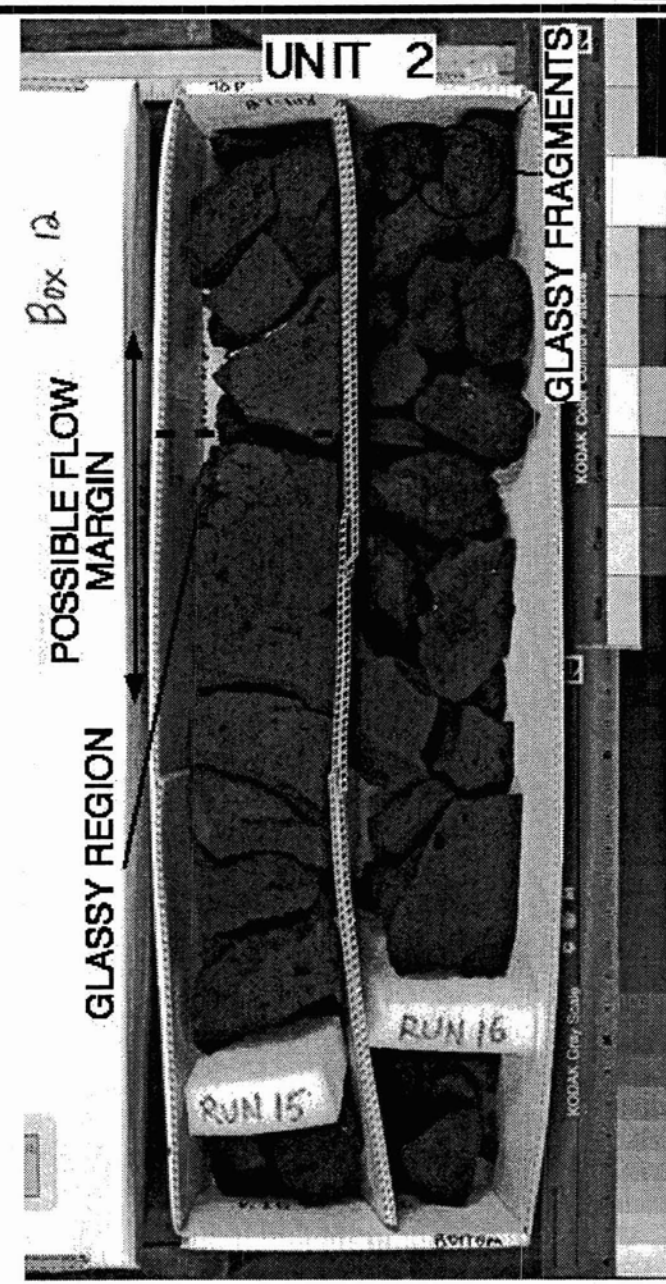
Loggers:	HJY
Date logged:	10/30/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	74.3
Driller's depth:bottom [feet]:	82.3
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt

UNIT #:2

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-5% – 1-2 mm – see comment –
range: <1~4 mm, small grains: equant, big grains: tabular, spinel inclusions in big grains
plagioclase – 1-2% – <1 mm – tabular (>3:1:1) –
range: <1~1 mm
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – spherical – equant –
Ranging from 10 to <1 mm, mostly within 3~<1 mm; pipe vesicles present.
Alteration: fresh (<2% altered) – iron oxide
Concentrated along the 2.4 ft potential flow margin in run 14. Also in some rubble of run 15.
Veins: none
Fractures: weakly fractured: 6/1.4 ft
Additional comments:
Glassy zone at R14-2.4; potential flow margin. Glassy fragments in run 15. NaCl ppt.



Box #:	Cores in box	
13	16	19
	17	
	18	

Loggers:	MBB, LW
Date logged:	10/30/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	82.3
Driller's depth:bottom [feet]:	89.6
Core type:	PQ
Units in box:	1

BOX UNIT 1: sparsely plagioclase-olivine phyric basalt **UNIT #:2**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Note that Box 12 contained rubbly material - no indication of a contact.

Unit type: massive/rubbly
Most of the box contains rubbly material; some of the material has multiple drill cuts.

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant to blocky –
Spinel inclusions in some olivines; olivine crystal clots also present.
plagioclase – <1% – <1 mm – tabular (>3:1:1) –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N2 grayish black – **Structures:** – **Sorting:** –

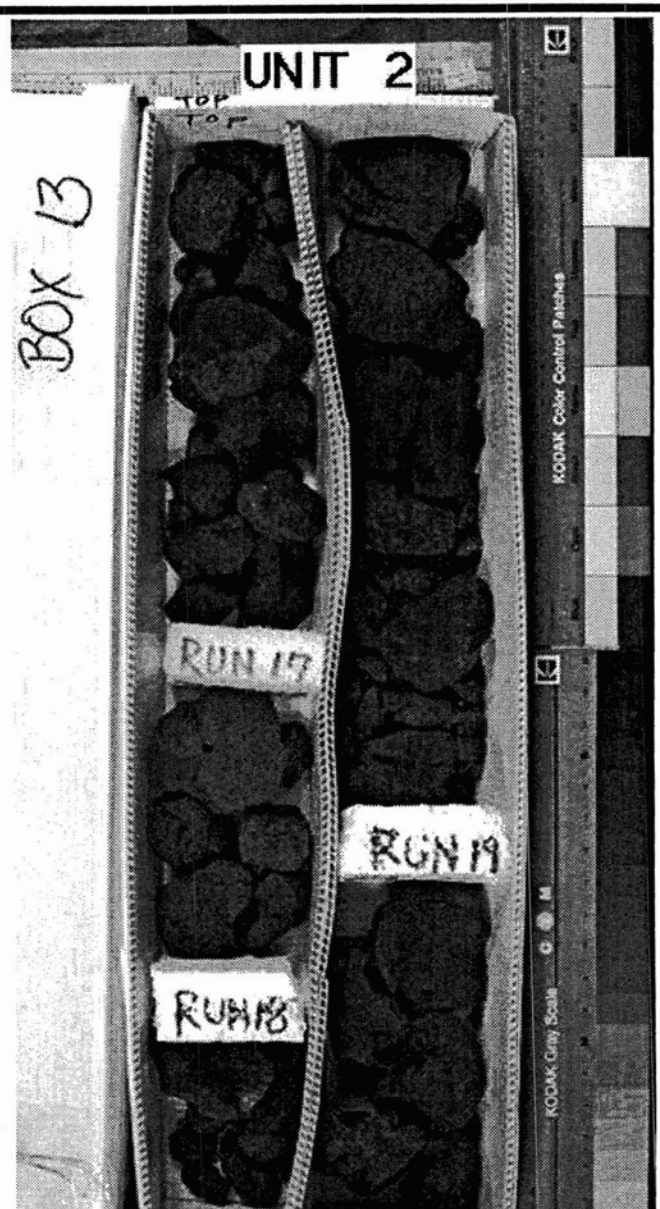
Vesicles: 5-10% total – 10-20 mm; 1-2 mm – subrounded-subangular; rounded – elongate; equant –
Two populations of vesicles, large size is relatively rare; each entry above describes a single population.

Alteration: fresh (<2% altered) –

Veins: none

Fractures: Due to the rubbly nature of the material, difficult to characterize fractures.

Additional comments:
NaCl ppt on many surfaces; some of the pieces have light yellow-orange carbonate (acid-test) coating; glass present at R16 at 84'.



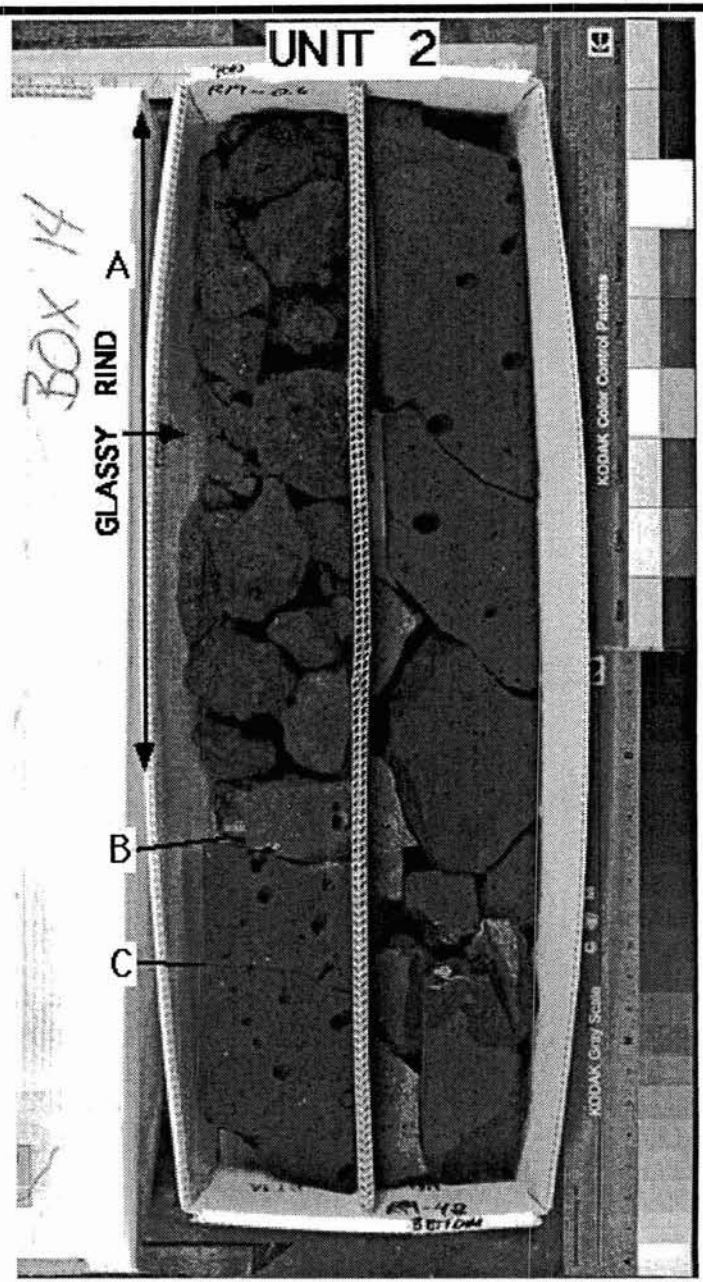
Box #:	Cores in box
14	19

Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	89.6
Driller's depth:bottom [feet]:	91.3
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:2**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Zone A is rubble/cave. Massive below zone A.
Phenocrysts/Clasts:
moderately phyric (2-10%) – closer to 2% than 10%; 200 points counted for mode
olivine – 1-2% – 1-2 mm – blocky (<3:1:1) –
Size range 1-7 mm. Some clusters. Larger olivines contain spinel inclusions.
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
Size range <1-2 mm. Most plagioclases are microphenocrystic (<1 mm).
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-2 mm – rounded – equant –
Rubble is more vesicular than massive core (10-20%). Continuous core section grades from more highly to less highly vesiculated down-section. Size range from <1-3 mm. Between bottom of rubble zone A and R19-4.0 a second population of large (5-18 mm) vesicles is present, becoming more abundant up-section.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Moderately fractured: 11/2.8 ft in continuous core below zone A. Orientations range from 0-80°. White-yellow coating on top two fracture (B and C). Weakly fractured (R19-2.5 to 4.0) to moderately fractured (>R19-4.0).
Additional comments:
Some NaCl ppt along dried fractures. Some glass rinds on rubble in zone A, but no lithologic variation above and below this zone (probably same unit). B=10° fracture with white-orange coating. C=5° fracture with white-orange coating.



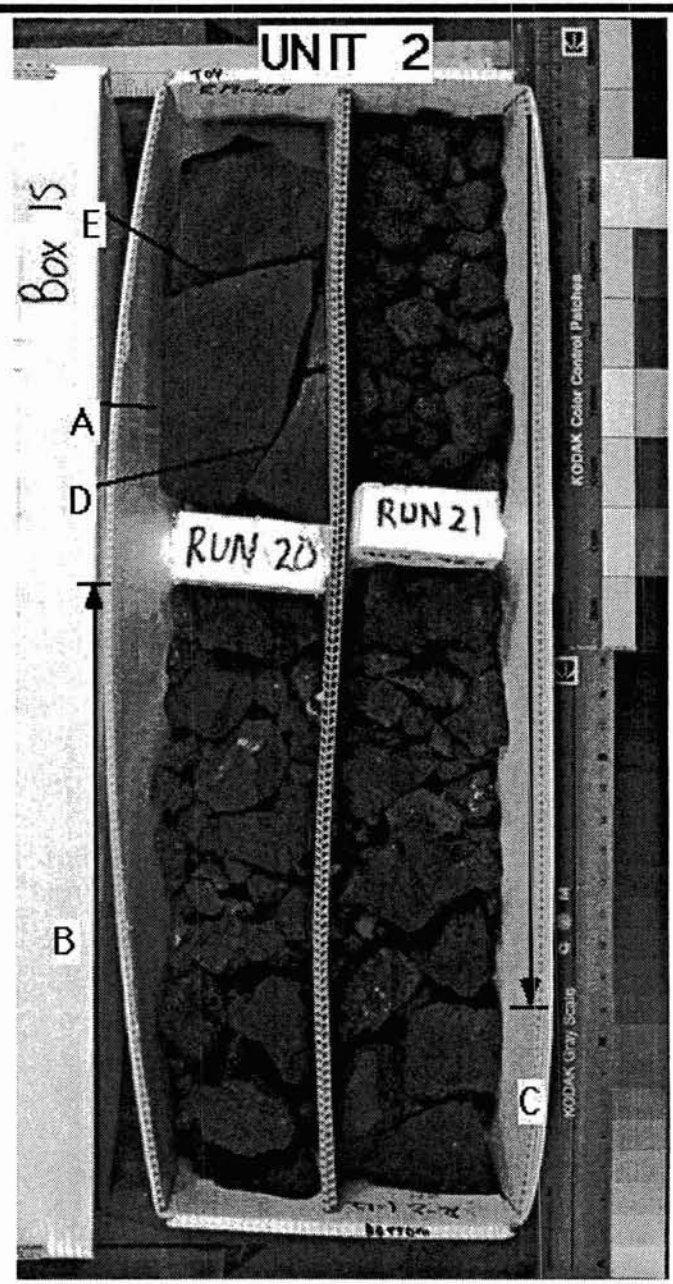
Box #:	Cores in box
15	19 20 21

Loggers:	MBB
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	91.3
Driller's depth:bottom [feet]:	92.8
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:2**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Massive portion is from top of Box 15 to top of run 20 (labeled "A" on photo).
Phenocrysts/Clasts:
moderately phyric (2-10%) – olivine>plagioclase
olivine – <5% – 2 mm – equant to blocky –
Spinel inclusions; some olivine crystal clots.
plagioclase – 1-2% – <1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N2 grayish black – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-2 mm – rounded – equant –
very rare vesicles >5 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: massive region ("A") is weakly fractured; fractures "D" = 65°, "E" = 20°
Additional comments:
NaCl ppt on surfaces. "B" = zone of cave/rubble, pieces have multiple drill cuts; petrographically the material is similar in appearance to the massive zone at the top of the box. Some of the surfaces have a slightly "glassy"/cryptocrystalline sheen. "C" = reappearance of more massive material, similar in appearance to the material in zone "A".



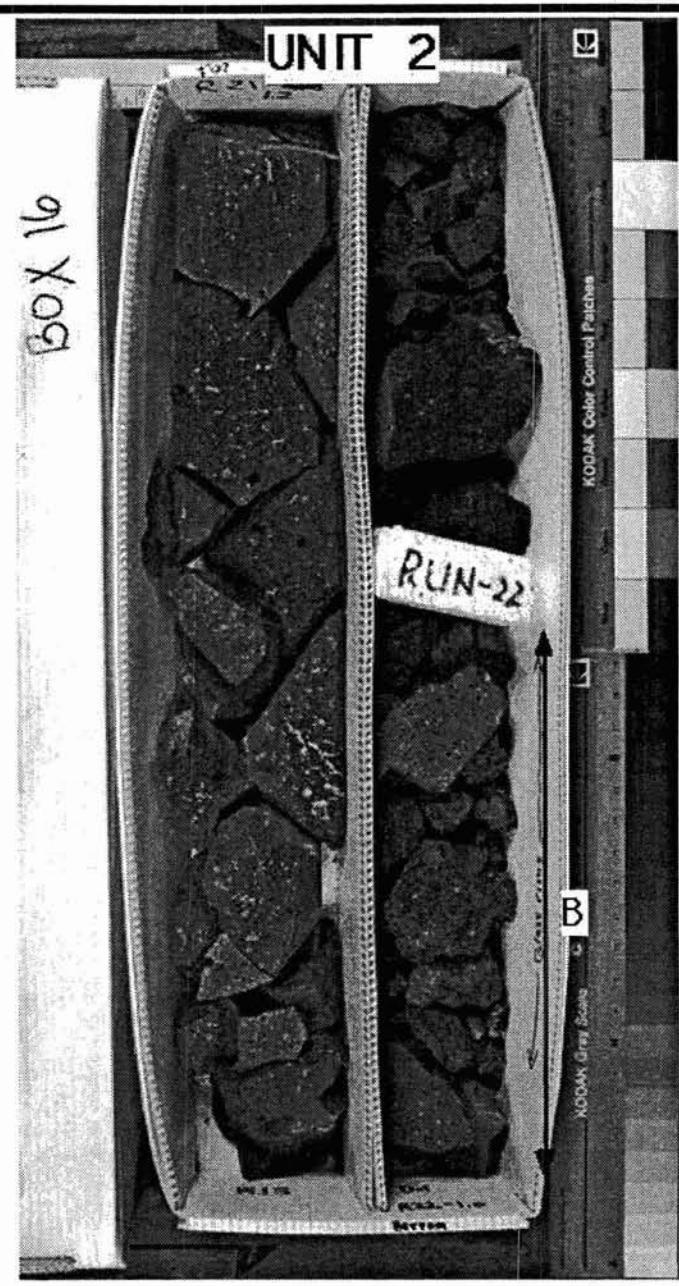
Box #:	Cores in box
16	21 22

Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	92.8
Driller's depth:bottom [feet]:	97.7
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:2**

Contacts: Top (ft): (R --')(continuous with above)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
rubbly at base
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2% – 1-3 mm – blocky (<3:1:1) –
Size range <1-6 mm. Occasional spinel inclusions.
plagioclase – 1-2% – <1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline to cryptocrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1 mm – rounded – equant–
<1-2.5 mm with a few large (5-12 mm) vesicles
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Moderately fractured from R21-1.2 to 2.0. Highly fractured from R21-2.0 to 3.8. Orange-yellow coating of some fracture surfaces in highly fractured zone. R22-0.0 to end of box is rubble/cave.
Additional comments:
Some glassy to cryptocrystalline rinds on rubble from zone B (top of Run 22).



Box #:	Cores in box
17	22 25 23 24

Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	97.7
Driller's depth:bottom [feet]:	100.5
Core type:	PQ
Units in box:	4

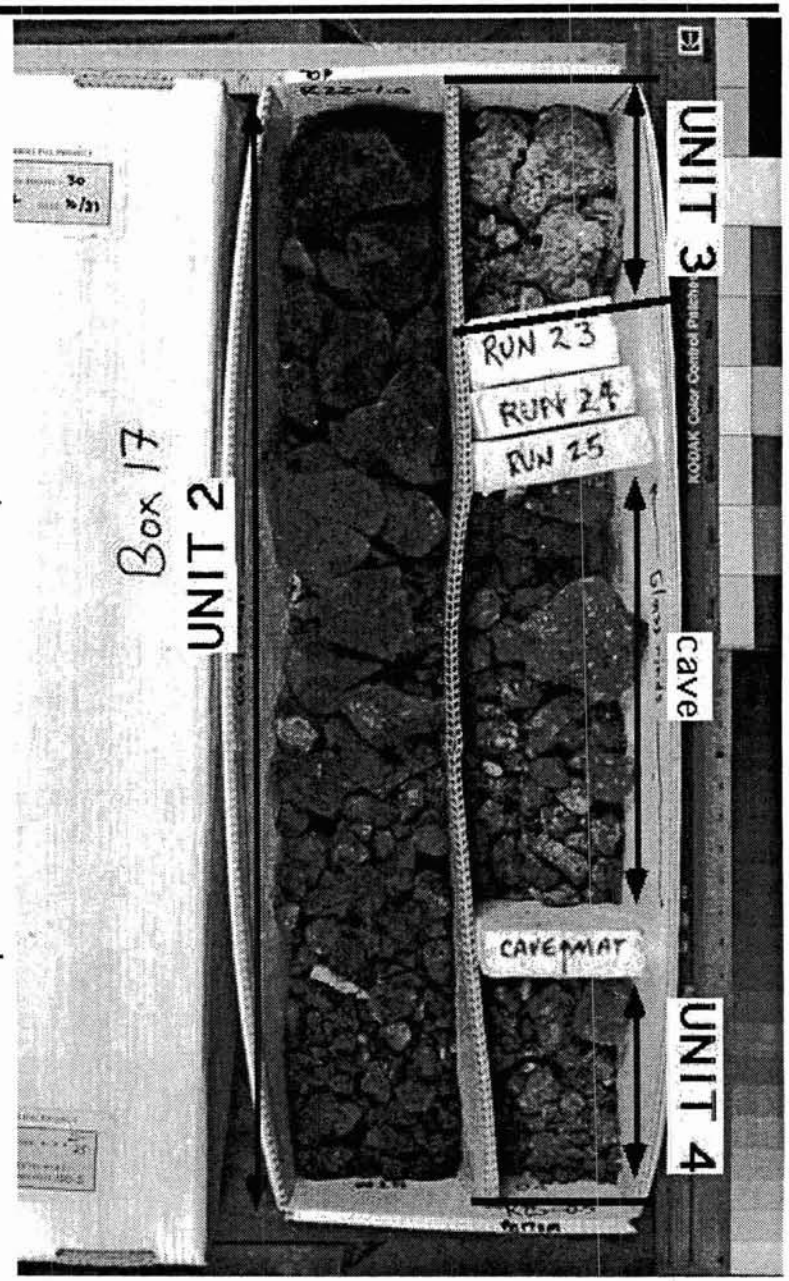
BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #: 2**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R22-3.0-**101.3**')(flow contact)
Unit type: rubble
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 1-2% – 1-2 mm – blocky (<3:1:1) –
plagioclase – 1% – <1 mm – tabular (>3:1:1) –
microphenocrysts
– – – –
Groundmass/Matrix: microcrystalline to glassy –
Color: N2 grayish black – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-2 mm – spherical – rounded–
range 1-8 mm
Alteration: fresh (<2% altered) –
Orange to yellow coating on some surfaces, particularly along glassy rinds.
Veins: none
Fractures: rubble
Additional comments:
Rubble grades from approx. 10 cm at R22-1.0 to 2 cm at R22-3.0, becoming more glassy with depth. Missing section from 95.5 to 104 ft.

BOX UNIT 2: calcareous sediment (coral rudstone) **UNIT #: 3**

Contacts: Top (ft): (R 22-3.0-**101.3**')(depositional)
Bottom (ft): (R23-0.0-**101.6**')(missing)
Basalt emplaced on top of sediments; bottom contact between R23 and R25-0.0.
Unit type: calciclastic sediment
Phenocrysts/Clasts:
10-50% – large coral fragments. less abundant small (1-4mm) glassy basalt fragments
coral fragments – >10% – >5 mm – sub-angular –
volcanic clasts – 1-2% – 1-5 mm – –
Concentrated on outer margin of core; probably from drilling.
– – – –
Groundmass/Matrix: fine sand – small shells, coral fragments preserved
Color: 10 YR 8/2 to 7/4 very pale orange to grayish yellow– **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:
Hardness = firm. No recovery from runs 23 and 24, and little or no section penetrated!

BOX 17 CONTINUED ON NEXT PAGE



Box #:	Cores in box
17	22 25 23 24

Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

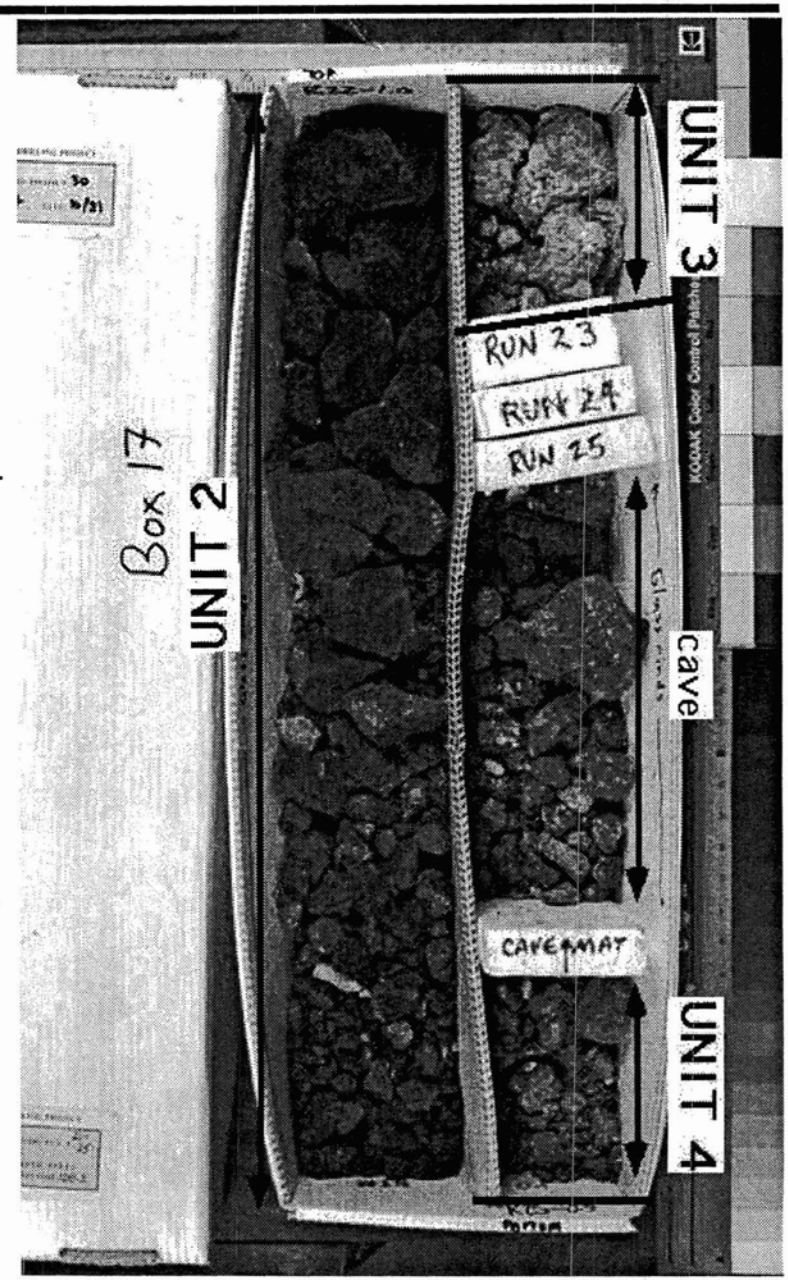
Driller's depth:top [feet]:	97.7
Driller's depth:bottom [feet]:	100.5
Core type:	PQ
Units in box:	4

BOX UNIT 3: sparsely to moderately plagioclase-olivine phyric basalt **UNIT #: -**

Contacts: Top (ft): (R --')(cave)
Bottom (ft): (R--')(cave)
Unit type: rubble
cave material from top of R25 with basalt and coral fragments
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 1-2% – 1-2 mm – blocky (<3:1:1) –
plagioclase – <1% – <1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – rounded – equant–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: cave/rubble
Additional comments:
Some glassy rinds present. No recovery from runs 23 and 24 (95.5-104). Caving problems reported after run 22. Basalt is similar to basalt from unit 1 in this box.
All cave material (not a flow unit!).

BOX UNIT 4: calcareous sediment **UNIT #: 4**

Contacts: Top (ft): (R 25-0.0-101.6')(missing)
Bottom (ft): (R25-0.6-102.2')(depositional)
top of unit between R23 and R25-0.0
Unit type: calciclastic
Phenocrysts/Clasts:
>50% – large (several cm) coral fragments
coral fragments – >50% – >1 cm – –
volcanic clasts – 2-10% – 1-5 mm – sub-angular –
found near top of unit
– – – –
Groundmass/Matrix: medium sand – small shells
Color: 5Y 6/1 light olive gray– **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
hardness = firm



Box #: 18

Cores in box: 25

Loggers: MBB
Date logged: 10/31/93
Checked by: MG
Check date: 11/3/93

Driller's depth:top [feet]: 100.5
Driller's depth:bottom [feet]: 104.0
Core type: PQ

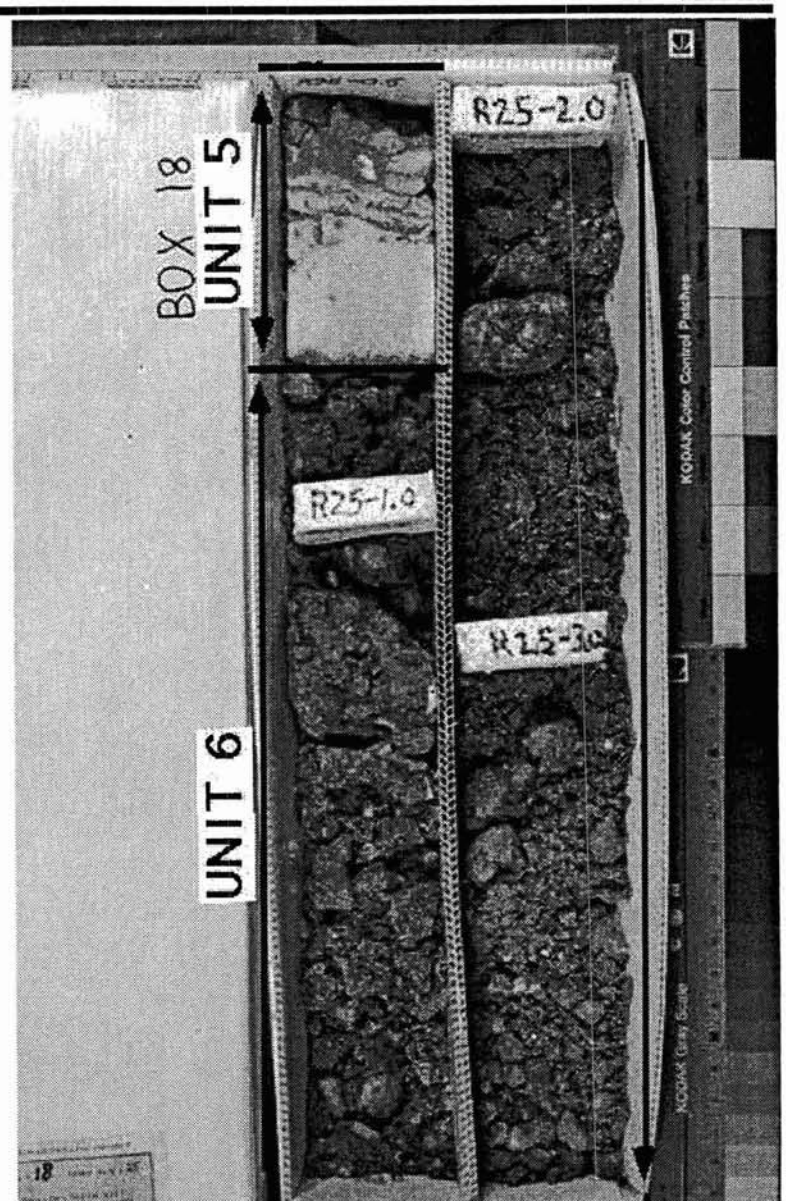
Units in box: 2

BOX UNIT 1: coral — UNIT #: 5

Contacts: Top (ft): (R 25-0.6-102.2')(depositional)
Bottom (ft): (R25-0.8-102.4')(depositional)
Top of unit defined by layers of calcareous sand to silt-sized material interbedded with pebble-sized subangular coral pieces.
Unit type: coral
Phenocrysts/Clasts:
–
– – – –
– – – –
– – – –
Groundmass/Matrix: –
Color: N9 white – **Structures:** Massive in lower part – **Sorting:** –
Vesicles: none – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: unfractured
Additional comments:
Hardness = firm

BOX UNIT 2: clast-supported calcareous sediment — UNIT #: 6

Contacts: Top (ft): (R 25-0.8-102.4')(depositional)
Bottom (ft): (R--')(continuing with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
10-50% –
coral fragments – >30% – 20 mm – chunky coral bits –
volcanic clasts – 2-10% – 1-5 mm – sub-rounded –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) – matrix is coral fragments, shell fragments and shells
Color: – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:
Hardness = soft. Gradual decrease in proportion of dark shell fragments from R25-0.8 to bottom of box.



Box #:	Cores in box
19	26 27

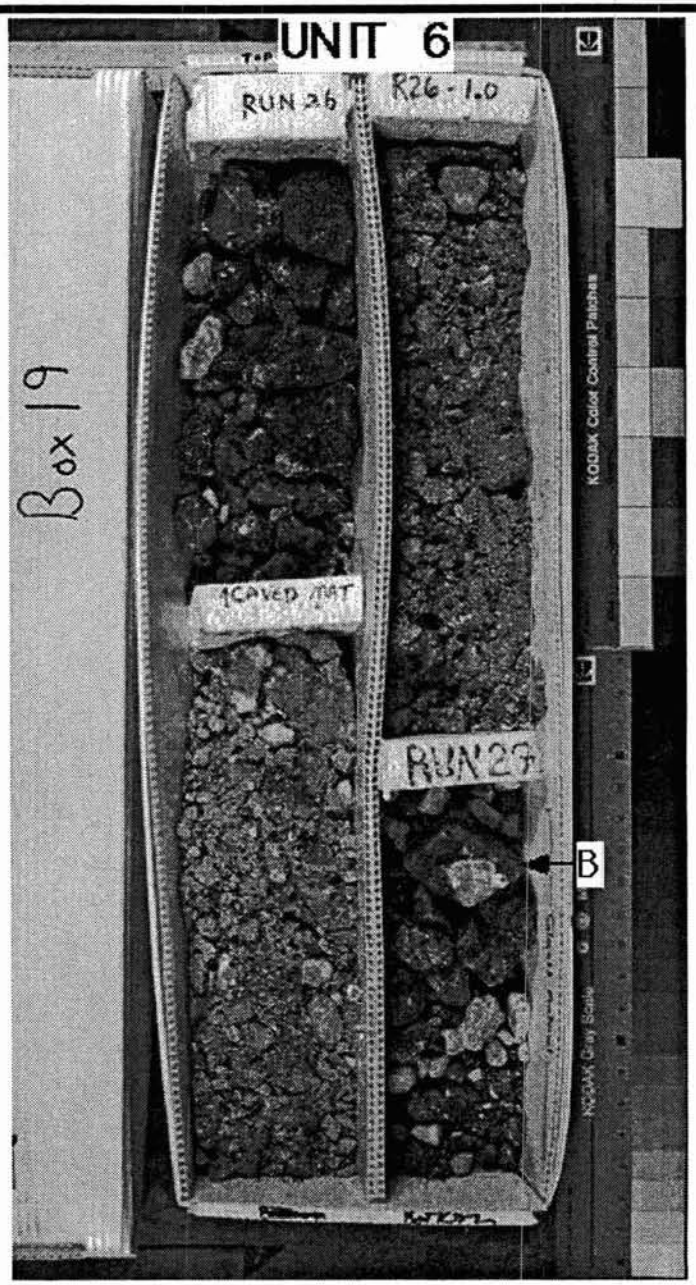
Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	104.0
Driller's depth:bottom [feet]:	106.5
Core type:	PQ
Units in box:	1

BOX UNIT 1: calcareous sediment

UNIT #:6

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
–
coral fragments – >10% – > 1 cm – sub-angular –
volcanic clasts – 1-2% – >5 mm – sub-rounded –
Some basalt fragments have drill marks; probably cave mixed in from above.
– – – –
Groundmass/Matrix: fine/medium sand (0.125-0.5 mm) – Subangular shell and coral fragments. 5-10% black (volcanic?) sand. Some well preserved 1-2 mm shells.
Color: 5Y 8/1 yellowish gray – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
Cave material at tops of runs 26 and 27 containing a mixture of basalt and coral fragments. Some basalt fragments have cement infilling vesicles. Basalt similar to basalt from above sediment interface. Fragment "B" on photo has piece of carbonate attached – probably came from basalt/sediment contact. Glassy rinds found on some basalt pieces in both cave zones.



Box #:	Cores in box
20	27 28

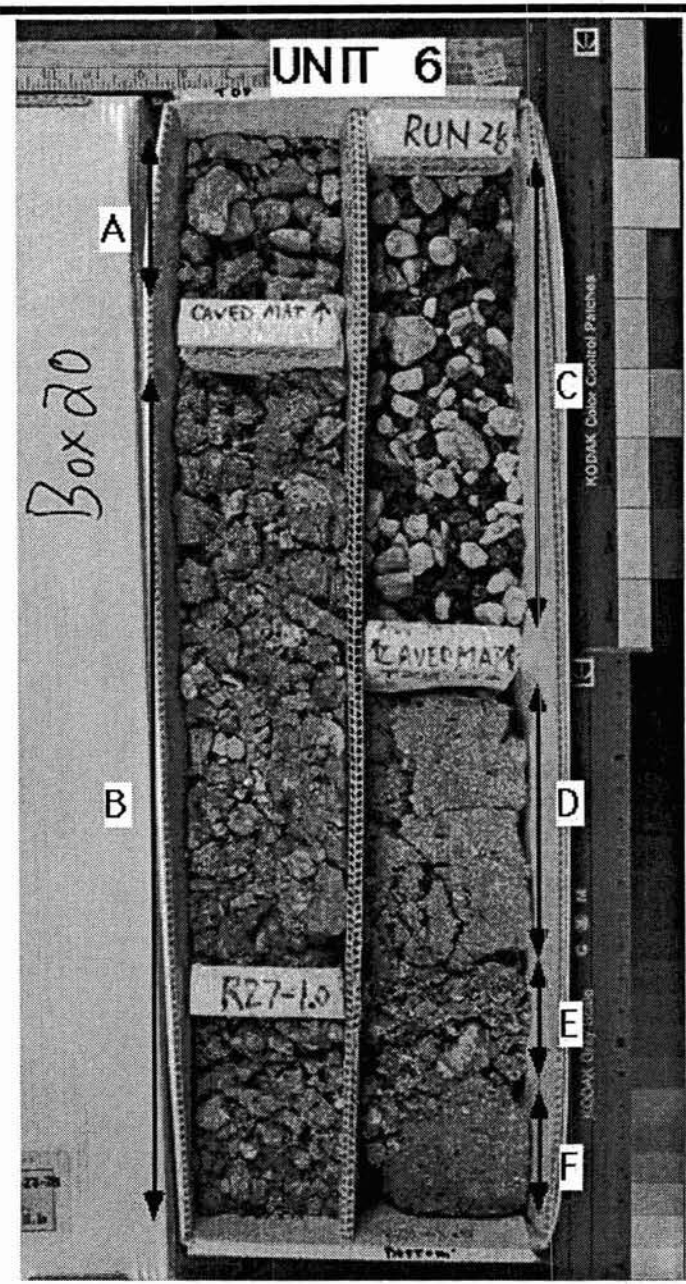
Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	106.5
Driller's depth:bottom [feet]:	111.6
Core type:	PQ
Units in box:	1

BOX UNIT 1: calcareous sediment

UNIT #:6

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
>50% –
coral fragments – 50% – >10 mm – sub-angular –
– – – –
– – – –
Groundmass/Matrix: fine/medium sand (0.125-0.5 mm) – angular shell fragments with microfossils
Color: 5Y 6/1 light olive gray – **Structures:** bedded (thick) – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
A = caved material at top of R27 mostly coral pieces with some basalt; B = described above; C = cave at top of R28, 50% basalt, 50% coral; D = decrease in abundance of large coral clasts to <10% from R28-0.0 to R28-0.5; E = return of large coral fragments from 0.5-0.7; F = few large coral fragments



Box #:	Cores in box
21	28 29

Loggers:	MBB
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

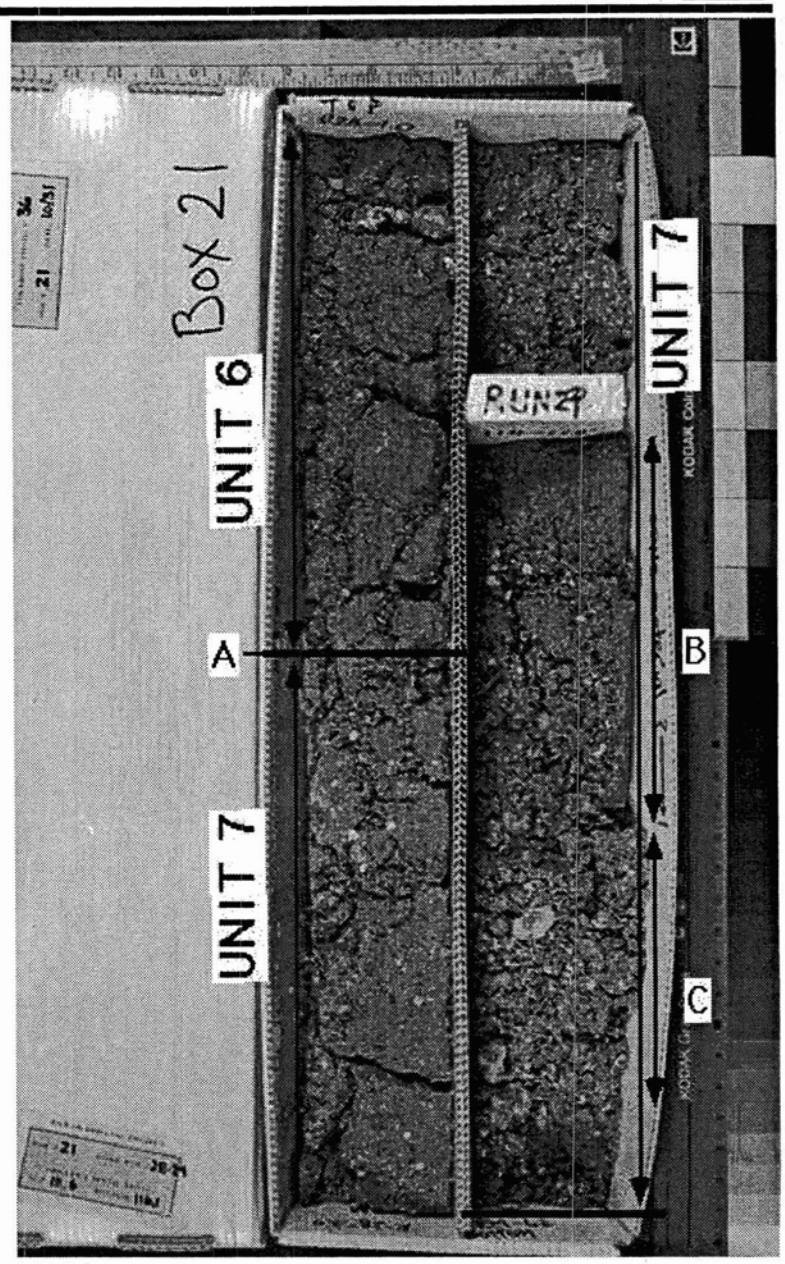
Driller's depth:top [feet]:	111.6
Driller's depth:bottom [feet]:	116.1
Core type:	PQ
Units in box:	2

BOX UNIT 1: matrix-supported calcareous sediment — UNIT #: 6

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R28-2.0-112.5')(depositional)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
10-20% –
coral fragments – 2-10% – 1-10 mm – sub-angular –
shell fragments – 10-20% – 1-5 mm – sub-angular –
volcanic clasts – 1-2% – 1 mm – sub-angular –
Groundmass/Matrix: medium-grained (1-5 mm) – Coral and shell fragments
Color: – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
Color transition at point labeled "A" in photo = decrease in proportion of blackish shell fragments. Call this a unit transition. Proportion of volcanic and mineral fragments probably <5%.

BOX UNIT 2: matrix supported calcareous sediment — UNIT #: 7

Contacts: Top (ft): (R 28-2.0-112.5')(depositional)
Bottom (ft): (R29-1.2-115.2')(depositional)
Unit type: neritic sediment
Phenocrysts/Clasts:
–
coral fragments – >10% – >5 mm – sub-angular –
shell fragments – 2-10% – >5 mm – angular –
– – – –
Groundmass/Matrix: medium-grained (1-5 mm) –
Color: – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
Zone labeled "B" represents cave material. Increase in proportion of coral and shell fragments down section (see "C").



Box #:	Cores in box
22	29 30 31

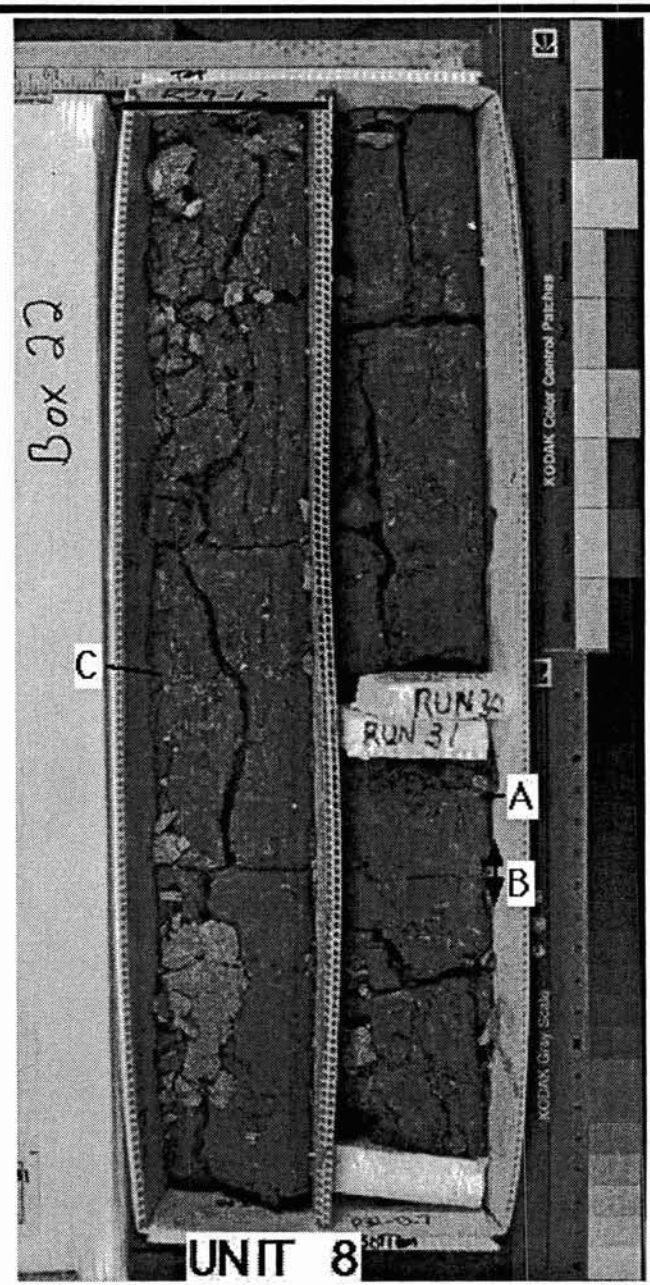
Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	116.1
Driller's depth:bottom [feet]:	127.2
Core type:	PQ
Units in box:	1

BOX UNIT 1: calcareous sediment

UNIT #:8

Contacts: Top (ft): (R 29-1.2-115.2')(depositional)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic
Phenocrysts/Clasts:
<10% –
shell fragments – <1% – 1-5 mm – angular –
– – – –
– – – –
Groundmass/Matrix: fine/medium sand (0.125-0.5 mm) – Some silt/clay. Some sponge spicules. Common (10%) dark, rounded grains (volcanic?).
Color: 5Y 6/1 light olive gray – **Structures:** bedded (thin) - a few bedding surfaces visible – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
A = faint bedding structure; B = finer silt/mud layer from R31-0.2 to 0.3; C = zone with more abundant coral/shell fragments (>1 mm).



Box #:	Cores in box
23	31

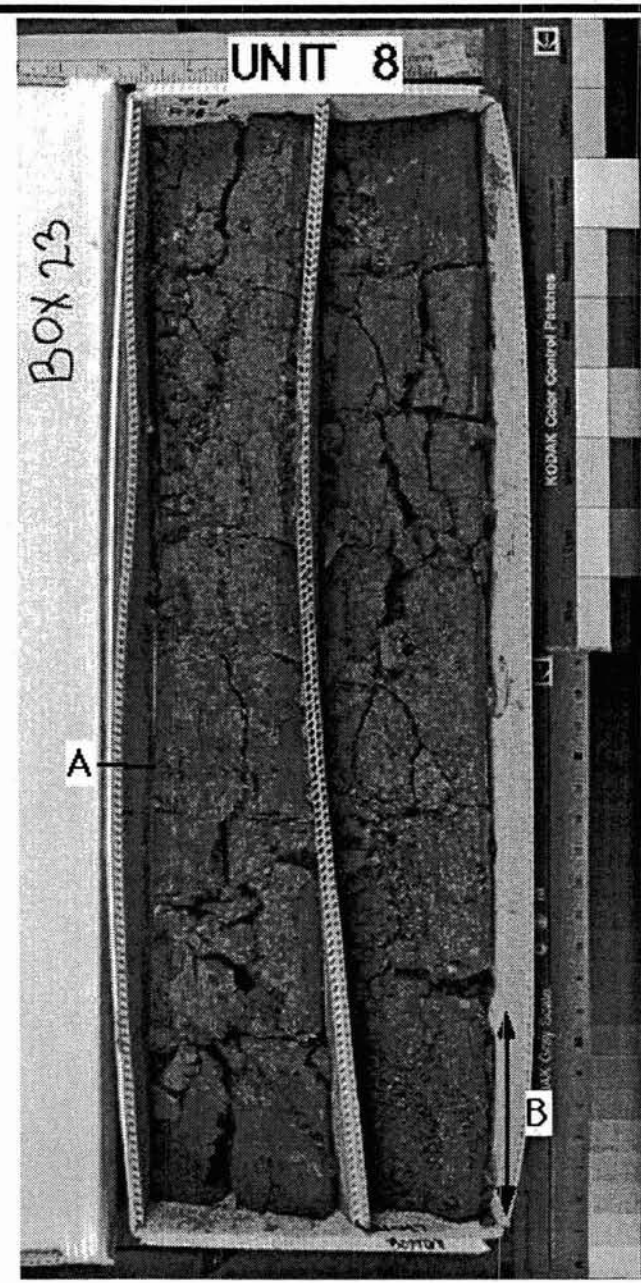
Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/3/93

Driller's depth:top [feet]:	127.2
Driller's depth:bottom [feet]:	131.2
Core type:	PQ
Units in box:	1

BOX UNIT 1: calcareous sediment

UNIT #:8

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic
Phenocrysts/Clasts:
<10% –
volcanic clasts – <1% – 1-5 mm – sub-rounded – rare spatter fragments
shell fragments – 1-2% – 1-5 mm – angular – some rare small pieces of coral as well
– – – –
Groundmass/Matrix: fine/medium sand (0.125-0.5 mm) – shell fragments with some sponge spicules
Color: 5Y 6/1 light olive gray – **Structures:** bedded (thin) – **Sorting:** well-sorted to poorly sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
A = layer with abundant shell fragments (1 mm) and dark (shell or basalt glass?) platy fragments. B = slightly coarser grained with shell fragments and rare fragments. Numerous layers of finer/coarser material present.



Box #: 24

Cores in box
31
32

Loggers: MBB
Date logged: 10/31/93
Checked by: MG
Check date: 11/3/93

Driller's depth:top [feet]: 131.2
Driller's depth:bottom [feet]: 139.5
Core type: PQ

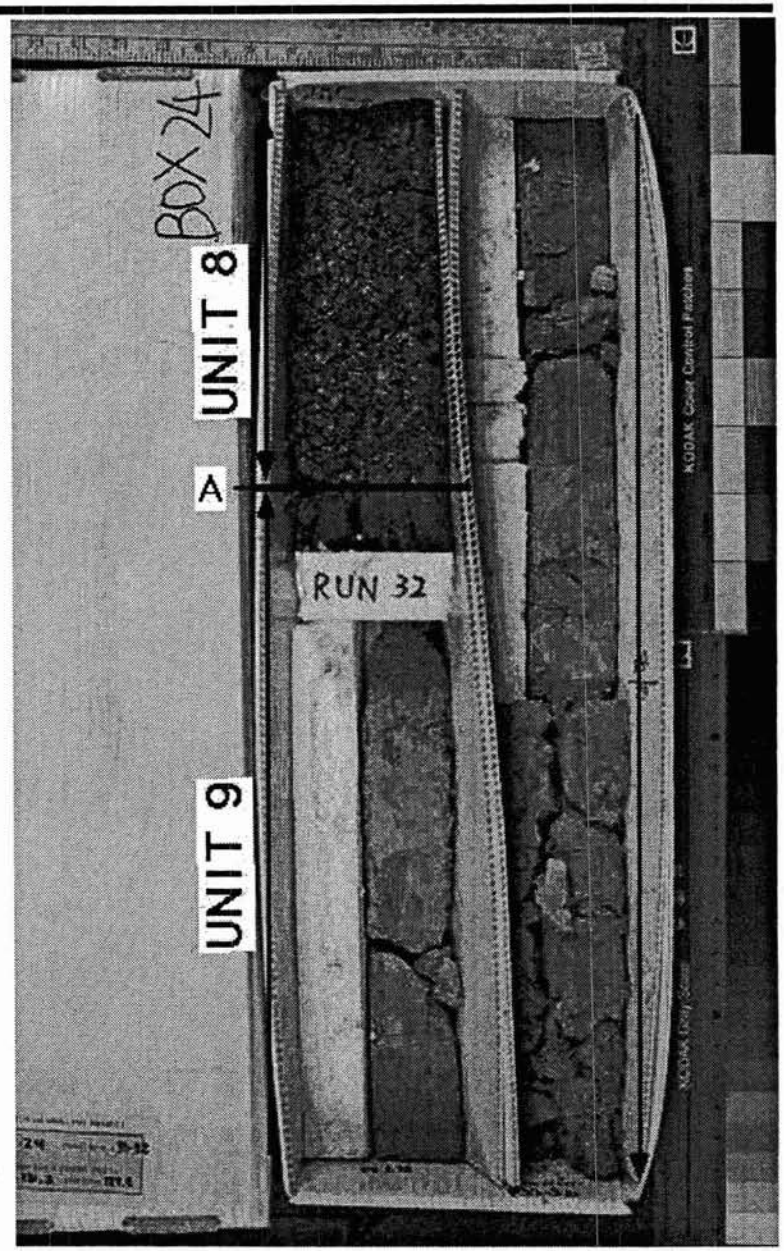
Units in box: 2

BOX UNIT 1: calcareous sediment — UNIT #: 8

Contacts: Top (ft): (R --')(continuous with above)
Bottom (ft): (R 31-5.4-127.4')(depositional)
bottom contact labeled "A" in photo
Unit type: neritic sediment
Phenocrysts/Clasts:
10-50% –
coral fragments – >10% – >5 mm – sub-angular –
shell fragments – >10% – 2-10 mm – sub-angular –
– – – –
Groundmass/Matrix: –
Color: – **Structures:** – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
Some irregularly shaped ~5-10 mm sized coral fragments.

BOX UNIT 2: calcareous sediment — UNIT #: 9

Contacts: Top (ft): (R 31-5.4-127.4')(depositional)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
–
– – – –
– – – –
– – – –
Groundmass/Matrix: clay to silt-size material –
Color: – **Structures:** unbedded – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
Basalt pebbles are cave material - occur on the outer surface of the core. The smaller core diameter is due to scouring by the basalt pebbles.



Box #:	Cores in box
25	32 33

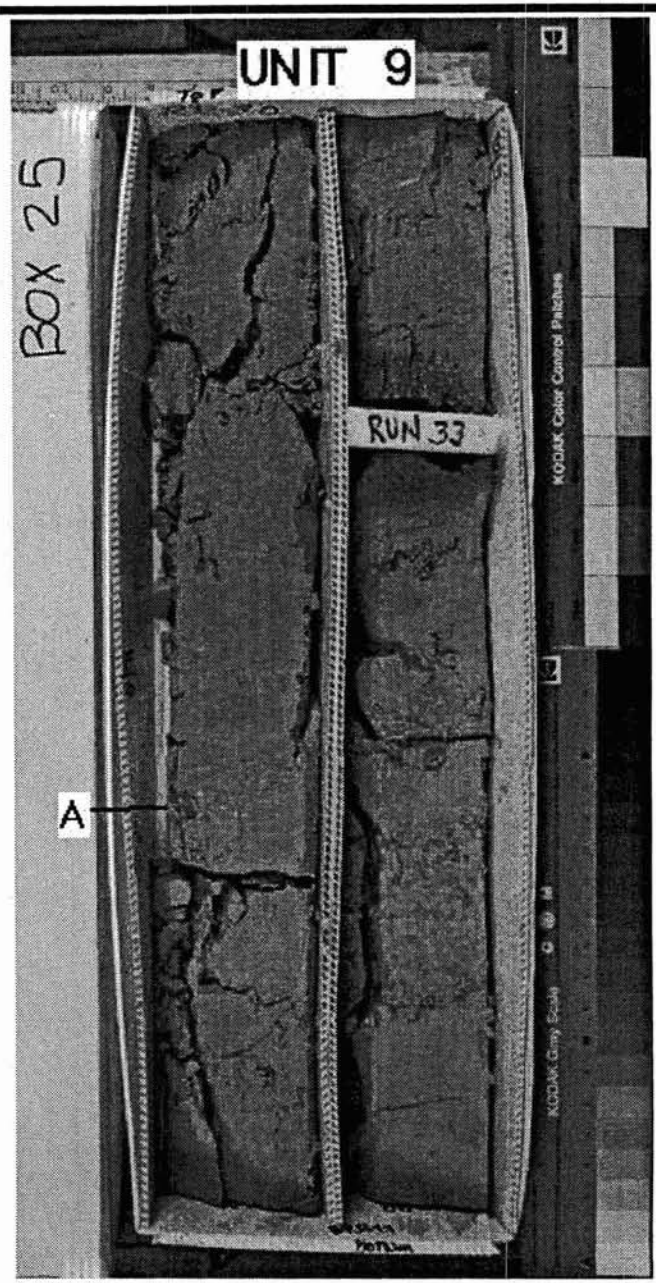
Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	139.5
Driller's depth:bottom [feet]:	150.0
Core type:	PQ
Units in box:	1

BOX UNIT 1: calcareous sediment

UNIT #:9

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
<1% –
shell fragments – <1% – 1-5 mm – angular –
– – – –
– – – –
Groundmass/Matrix: silt/clay (<0.125 mm) –
Color: 5GY 6/1 greenish gray – **Structures:** unbedded – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:
A = shell fragments (1-4 mm). Basalt pebbles armoring portions of core are probably from up-section, introduced during drilling - see photo and description for box 24.



Box #:	Cores in box
26	33 34

Loggers:	MBB
Date logged:	10/31/93
Checked by:	MG
Check date:	11/4/93

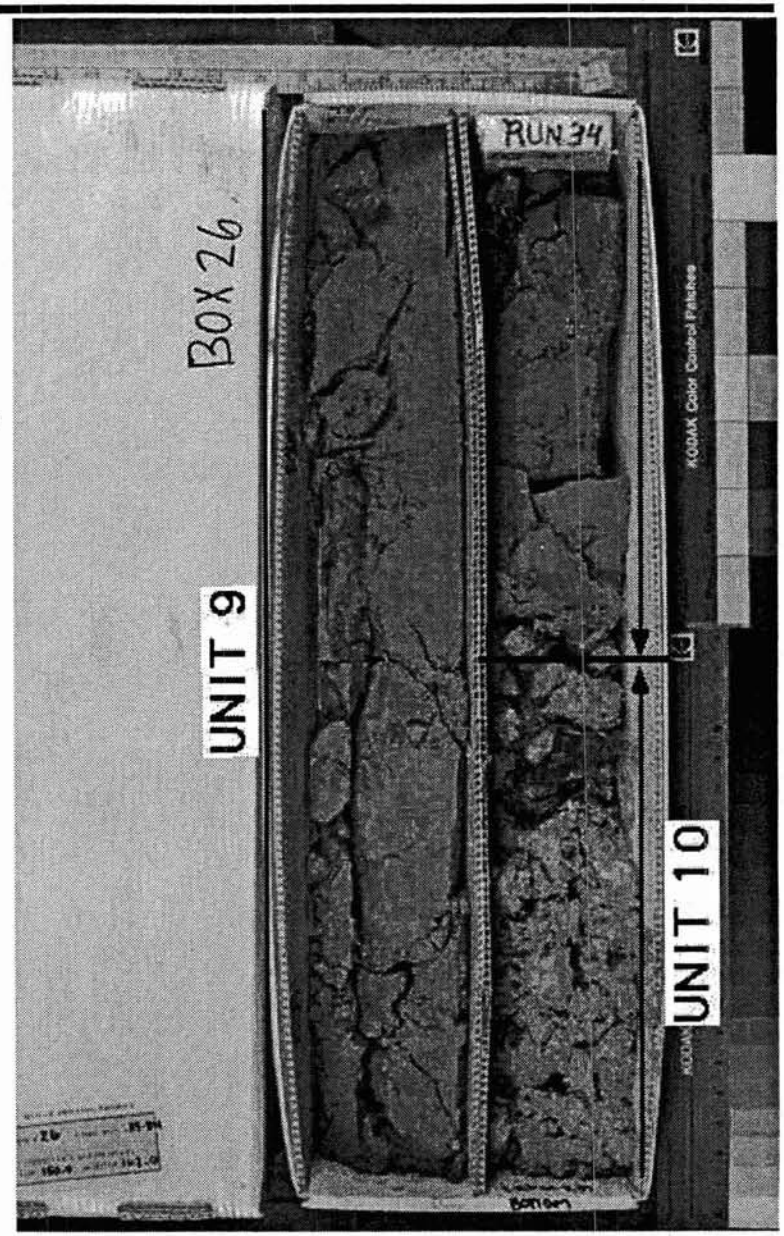
Driller's depth:top [feet]:	150.0
Driller's depth:bottom [feet]:	162.0
Core type:	PQ
Units in box:	2

BOX UNIT 1: calcareous sediment — **UNIT #: 9**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R34-1.0-153.0')(depositional)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
<1% –
– – – –
– – – –
– – – –
Groundmass/Matrix: silt/clay –
Color: N8 very light gray – **Structures:** massive – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: none –
Veins: none
Fractures: none
Additional comments:
fine, dark, speckled growth on surface (organics?)

BOX UNIT 2: clast-supported calcareous sediment — **UNIT #: 10**

Contacts: Top (ft): (R 34-1.0-153.0')(depositional)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic
Phenocrysts/Clasts:
–
coral fragments – >10% – 1-30 mm – coral-shaped –
some of the pieces are >5 mm (to 75 mm)
– – – –
– – – –
Groundmass/Matrix: calcareous mud –
Color: – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:



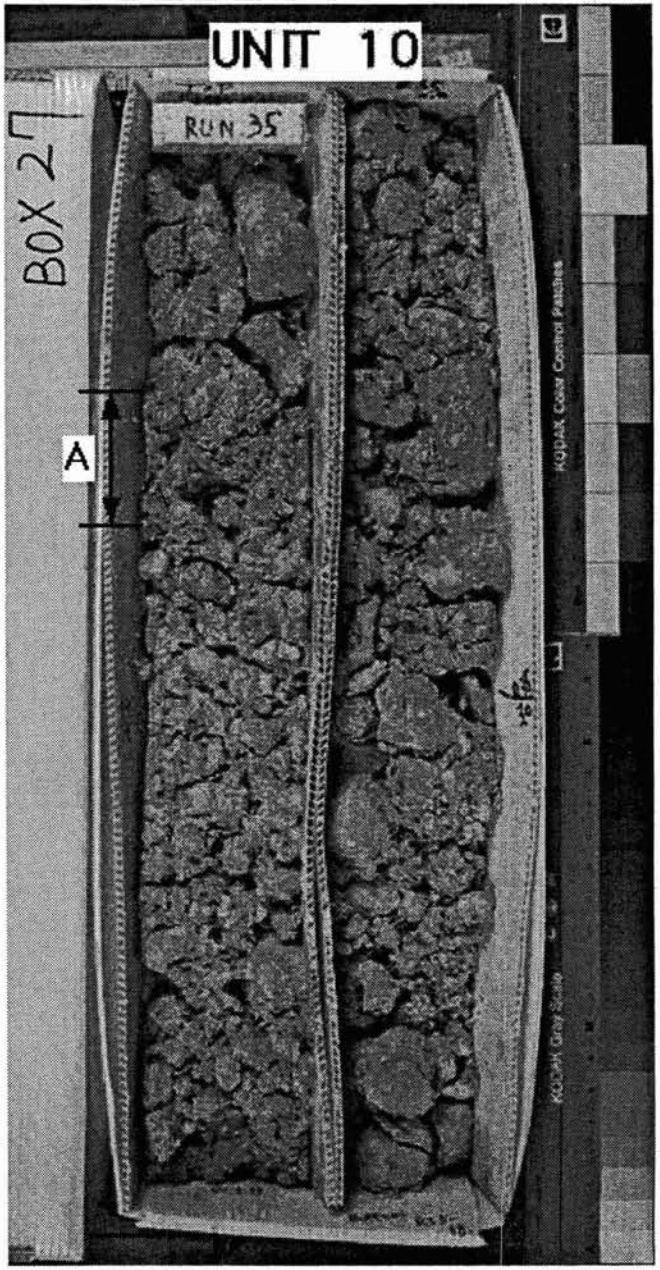
Box #:	Cores in box
27	35

Loggers:	JCL
Date logged:	10/31/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	162.0
Driller's depth:bottom [feet]:	167.0
Core type:	PQ
Units in box:	1

BOX UNIT 1: clast-supported calcareous sediment **UNIT #:10**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
>50% –
coral fragments – >50% – 1-3 cm – sub-angular –
up to 7 cm or more
shell fragments – 2-10% – 1-5 mm – platy –
Original colors preserved in many shells. Some whole shells preserved.
– – – –
Groundmass/Matrix: silt/clay (<0.125 mm) – clast-supported
Color: 5Y 8/1 yellowish gray – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:
A = zone from R35-0.5 and 0.8 containing small (<1 to 3 mm), angular, black to green grains of basalt glass?



Box #:	Cores in box
28	36

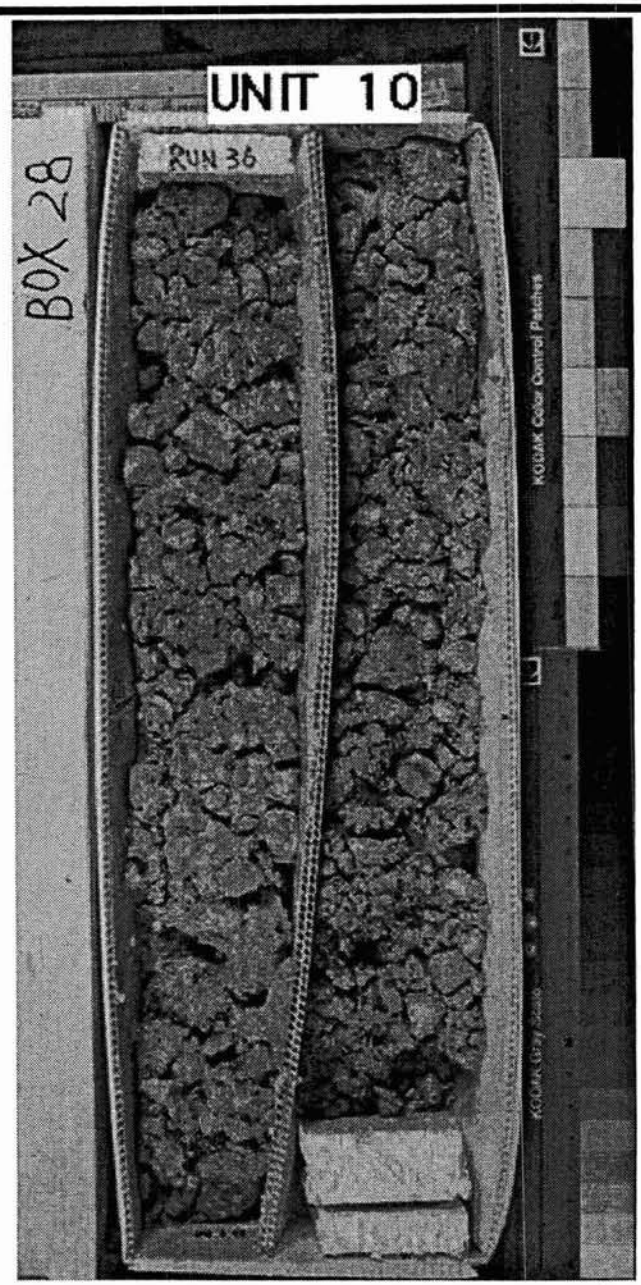
Loggers:	MBB
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	167.0
Driller's depth:bottom [feet]:	172.0
Core type:	PQ
Units in box:	1

BOX UNIT 1: clast-supported calcareous sediment

UNIT #:10

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
>50% –
coral fragments – >50% – 1-5 cm – sub-angular –
shell fragments – 2-10% – 1-5 mm – angular –
– – – –
Groundmass/Matrix: silt/clay (<0.125 mm) –
Color: – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:



Box #:	Cores in box
29	37

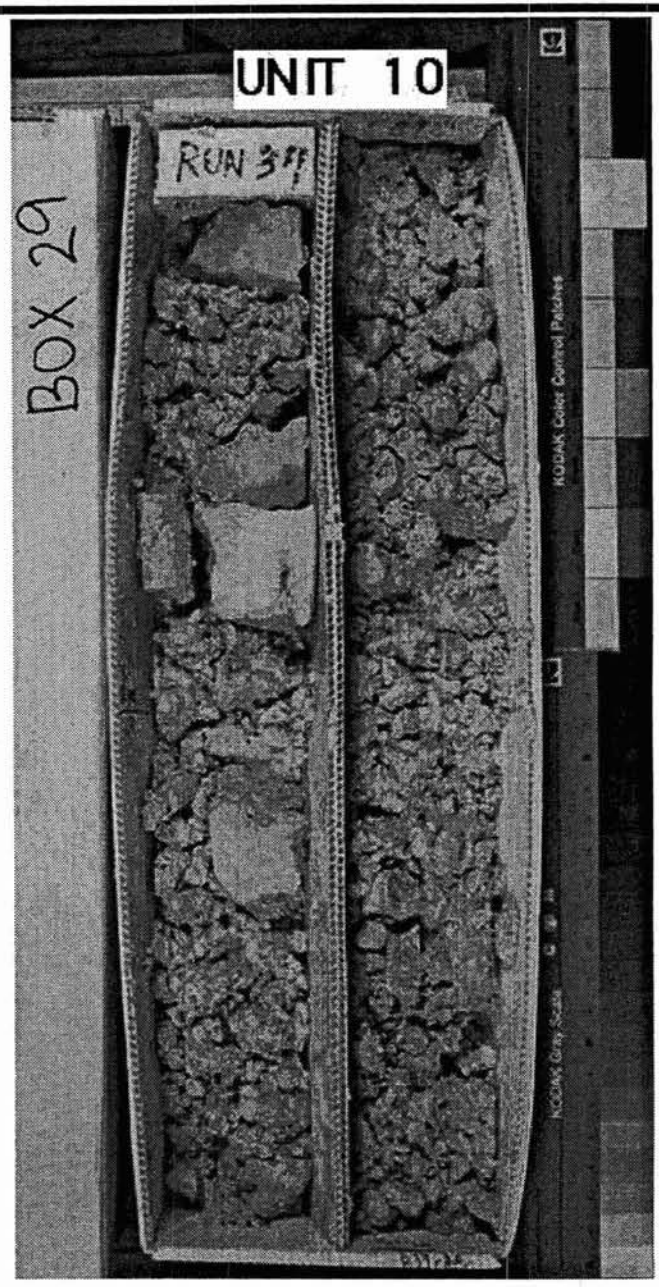
Loggers:	MBB, JCL
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	172.0
Driller's depth:bottom [feet]:	175.8
Core type:	PQ
Units in box:	1

BOX UNIT 1: clast-supported calcareous sediment

UNIT #:10

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
>50% –
coral fragments – >50% – 5 cm – –
up to 11 cm
– – – –
– – – –
Groundmass/Matrix: fine sand/silt/clay (<0.125 mm) –
Color: – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:



Box #:	Cores in box
30	37 38

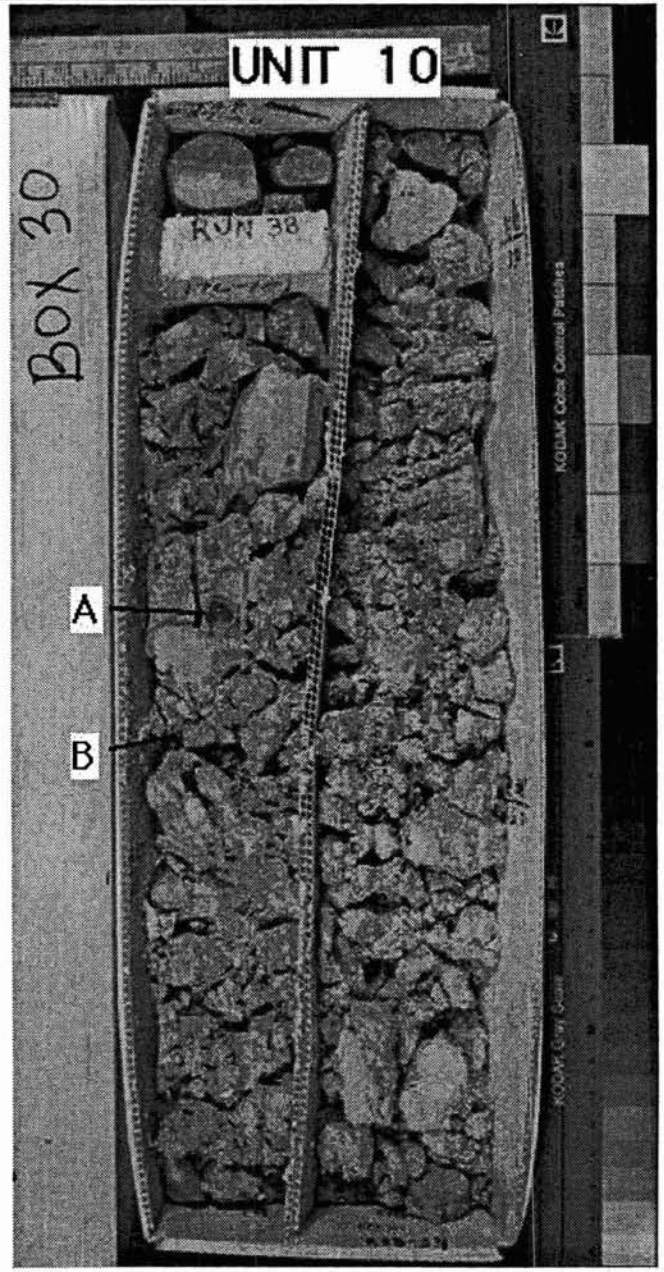
Loggers:	MBB, JCL
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	175.8
Driller's depth:bottom [feet]:	180.7
Core type:	PQ
Units in box:	1

BOX UNIT 1: clast-supported calcareous sediment

UNIT #:10

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
>50% –
coral fragments – >50% – 5 cm – angular – up to 10 cm
shell fragments – 2-10% – >5 mm – angular – unbroken shells
– – – –
Groundmass/Matrix: silt/clay (<0.125 mm) –
Color: – **Structures:** unbedded – **Sorting:** poorly-sorted –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:
A = 2 cm fragment of pelecypod; B = 2.5 cm gastropod complete shell



Box #:	Cores in box
31	38 39 40

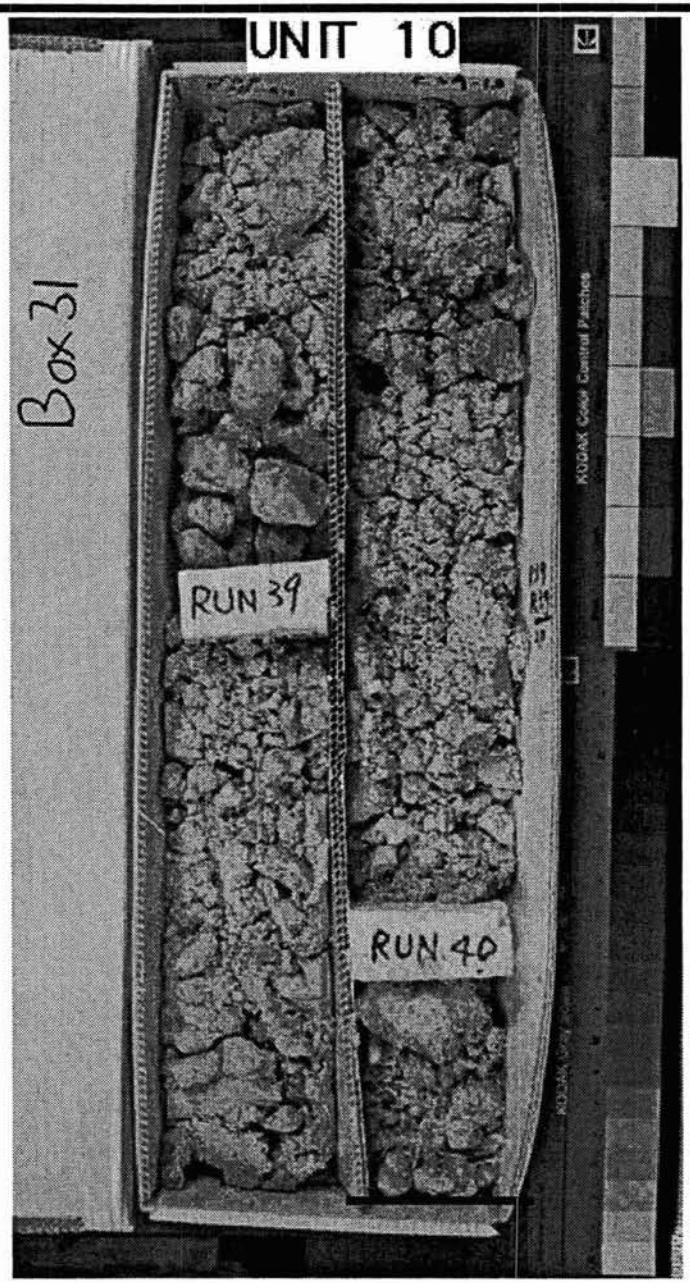
Loggers:	MBB, JCL
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	180.7
Driller's depth:bottom [feet]:	187.9
Core type:	PQ
Units in box:	1

BOX UNIT 1: clast-supported calcareous sediment

UNIT #:10

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R40-0.5-185.5')(depositional)
Unit type: calciclastic sediment
Phenocrysts/Clasts:
>50% –
coral fragments – >50% – 1-2 mm – angular –
up to 7 cm
– – – –
– – – –
Groundmass/Matrix: fine sand/silt/clay (<0.125 mm) –
Color: – **Structures:** – **Sorting:** –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:
R39-0.0 to 1.0 contains coral pieces with orange discoloration.



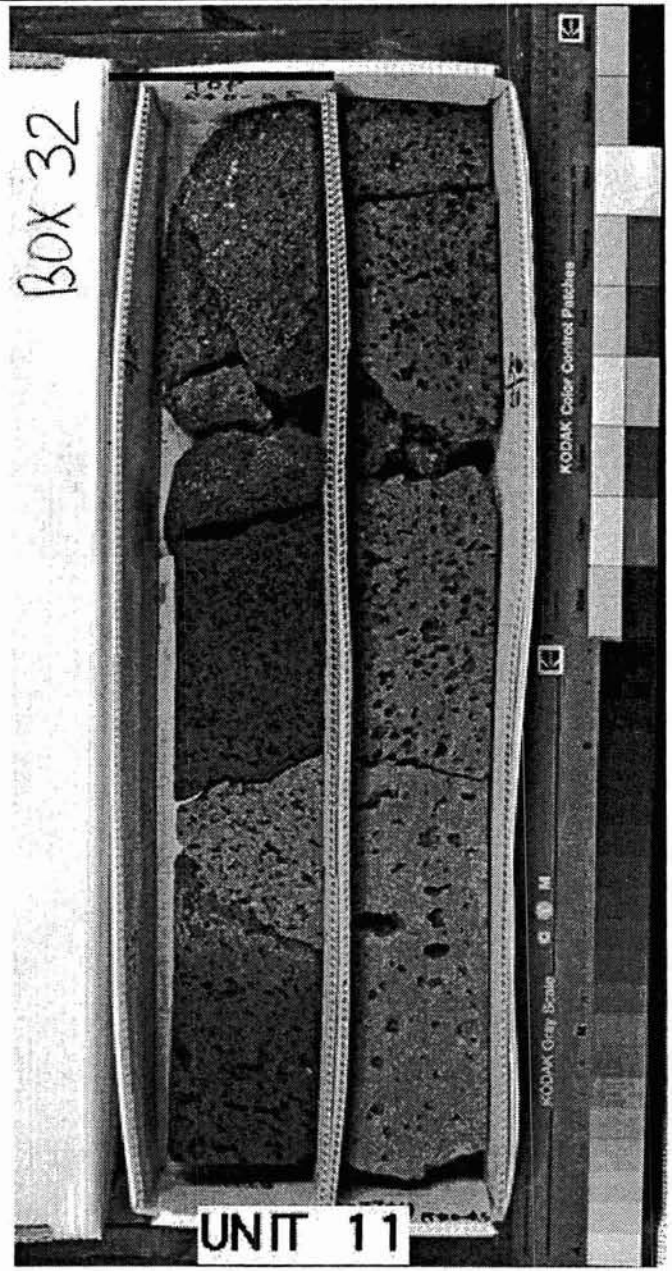
Box #:	Cores in box
32	40

Loggers:	MBB
Date logged:	10/31/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	187.9
Driller's depth:bottom [feet]:	192.0
Core type:	PQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R 40-0.5-185.5')(depositional)
Bottom (ft): (R--')(continuous with next box)
calcareous sediment overlies basalt
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (10-20%) – 200 pts. counted (11/100 and 15/100)
olivine – 10-20% – 1-5 mm – equant-blocky –
Olivine distribution appears homogeneous, although variation in vesicle population makes this determination difficult. Locally, altered grains occur in the interval R40-0.5 to R40-3.5. Olivines contain spinel inclusions. Some very large olivines (>5 mm). Some crystal clots.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – rounded to subrounded – equant to elongate –
Fe-oxide coating in some of the vesicles. Near the top of the box vesicle proportion approaches 50%; at the bottom of the box the proportion drops to ~10% and average size increases to ~10mm. Some calcareous vesicle fillings at the top of the box (R40-0.5 to R40-0.8).
Alteration: –
Veins: None
Fractures: Weakly fractured: 10/4'. Fe-oxide partially coating some of the fractures.
Additional comments:



Box #:	Cores in box
33	41

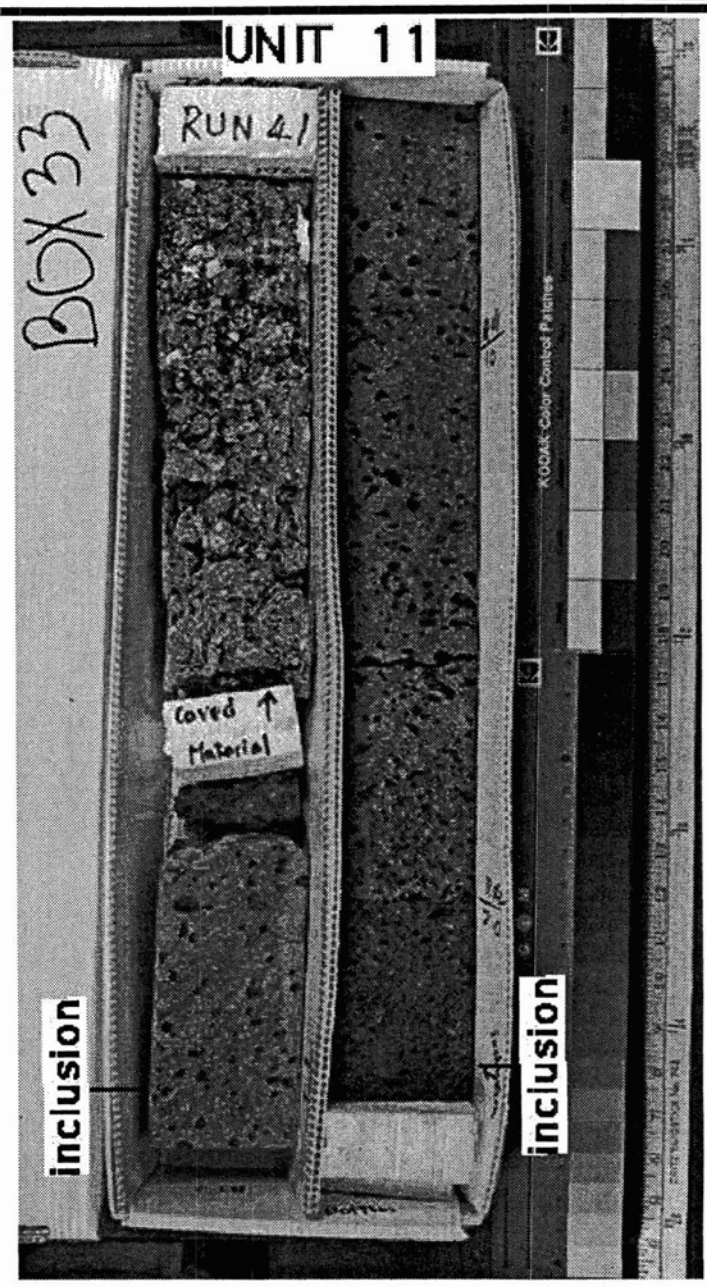
Loggers:	MBB
Date logged:	11/1/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	192.0
Driller's depth:bottom [feet]:	195.2
Core type:	PQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:11

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 3-4 mm – equant to blocky –
spinel inclusions; no apparent zoning in phenocryst abundance; some olivine grains >5 mm
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% at top; 10-20% at bottom – >5 mm at top; <5 mm at bottom – sub-rounded – elongated –
Vesicle size and proportion decrease down section; elongate vesicles subhorizontal.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
Small "gabbroic" inclusion (<10 mm in size) + an olivine+clinopyroxene inclusion. Location of both inclusions marked on photo.



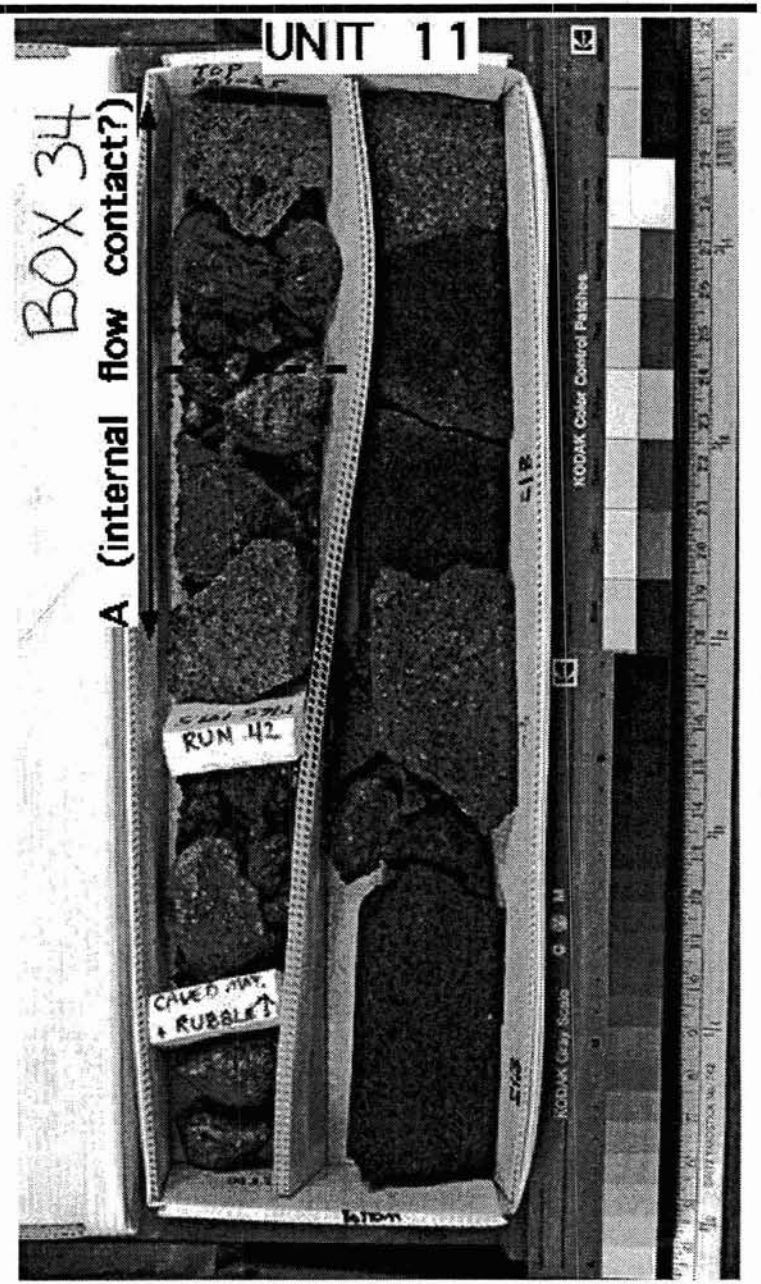
Box #:	Cores in box
34	41 42

Loggers:	MBB
Date logged:	11/1/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	195.2
Driller's depth:bottom [feet]:	198.9
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Subaerial flow. Internal flow contact thought to exist based on "glassy" oxidized ropy surface textures and the rapid increase in vesicles of decreasing size.
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 2-3 mm – equant to blocky –
Spinel inclusions; some olivines > 5 mm; some present in crystal clots.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: >50% near contact – 2-3 mm – – –
Elongate vesicles are subhorizontal; near the contact many of the small vesicles are filled with very fine-grained pinkish material (stained zeolites?)
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Highly fractured with some rubbly material in the region of the contact.
Additional comments:
Internal contact zone labeled "A" on photo (R41-2.5 to R41-3.5); no lithologic change.



Box #:	Cores in box
35	42 43

Loggers:	JCL
Date logged:	11/1/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	198.9
Driller's depth:bottom [feet]:	203.3
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Internal flow contact at bottom of box inferred from presence of highly vesicular, discolored rubble with ropy flow textures questionable contact; no lithologic change.

Unit type: massive

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 2-3 mm – equant –
range 1-7 mm, spinel inclusions
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N3 dark gray – **Structures:** – **Sorting:** –

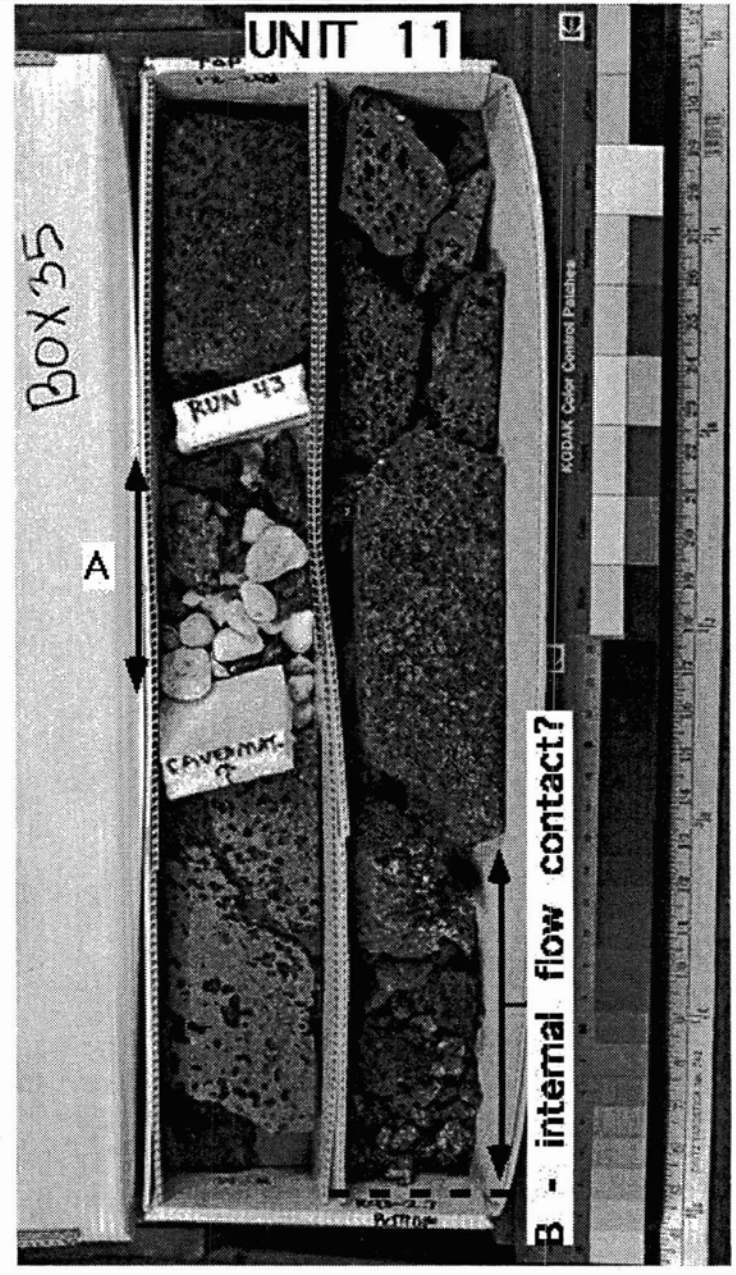
Vesicles: 20-30% – 1-5 mm – rounded – inclined–
Vesicles concentrated along 45° bands. Large vesicles (5 mm) are vertically elongated and are found above R43-1.7. Smaller bubbles are found below R43-1.7.

Alteration: fresh (<2% altered) –
Some yellowish to brownish discoloration and infilling of vesicles with a white-orange material in rubble from zone B (inferred contact).

Veins: none

Fractures: Moderately fractured above zone B - subhorizontal and some sub-vertical fractures. Some brown discoloration and infilling of vesicles with whitish material along fractures.

Additional comments:
A = cave material from top of R43 with coral and highly vesiculated basalt. Scoriaceous rubble from zone B (R43-2.2 to 2.7) is more highly discolored and has more infilling than above, and some surfaces have flow textures - inferred to be internal flow contact. NaCl ppt around olivines and fractures.



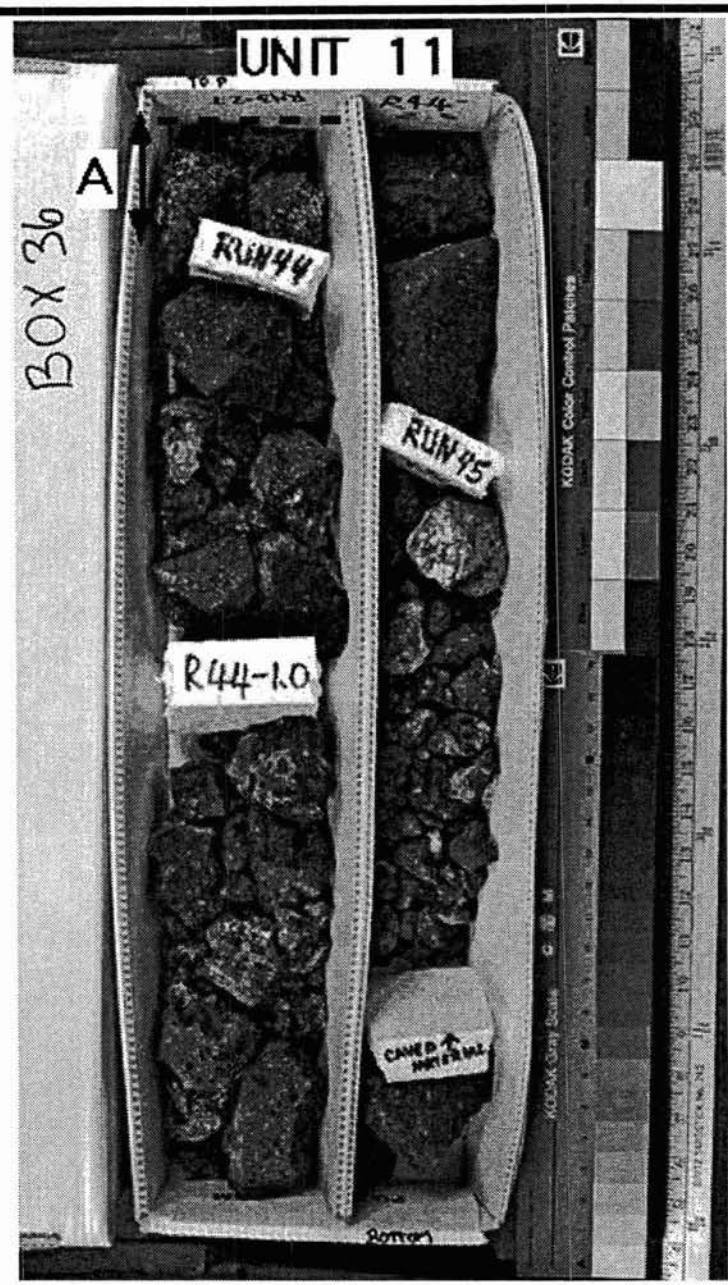
Box #:	Cores in box
36	43 44 45

Loggers:	JCL
Date logged:	11/1/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	203.3
Driller's depth:bottom [feet]:	206.6
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Questionable contact at top; no lithological change across it.
Unit type: rubble
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 1-5 mm – blocky (<3:1:1) –
spinel inclusions, multi-grain clusters
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N2 grayish black – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – rounded – elongated (1:2) –
Variable vesicle content-some rubble is highly vesiculated (>25%). Larger vesicles have diktytaxitic texture.
Alteration: slightly (2-10% altered) –
Brown discoloration and filling of some vesicles with white (zeolites?) material. Material becomes more massive and fresher with depth.
Veins:
Fractures: rubble to highly fractured
Additional comments:
"A"=highly vesicular rubble with surface flow features grades to more massive, less vesicular core with depth. NaCl ppt.; cave material at top of run 45.



Box #:	Cores in box
37	45 46

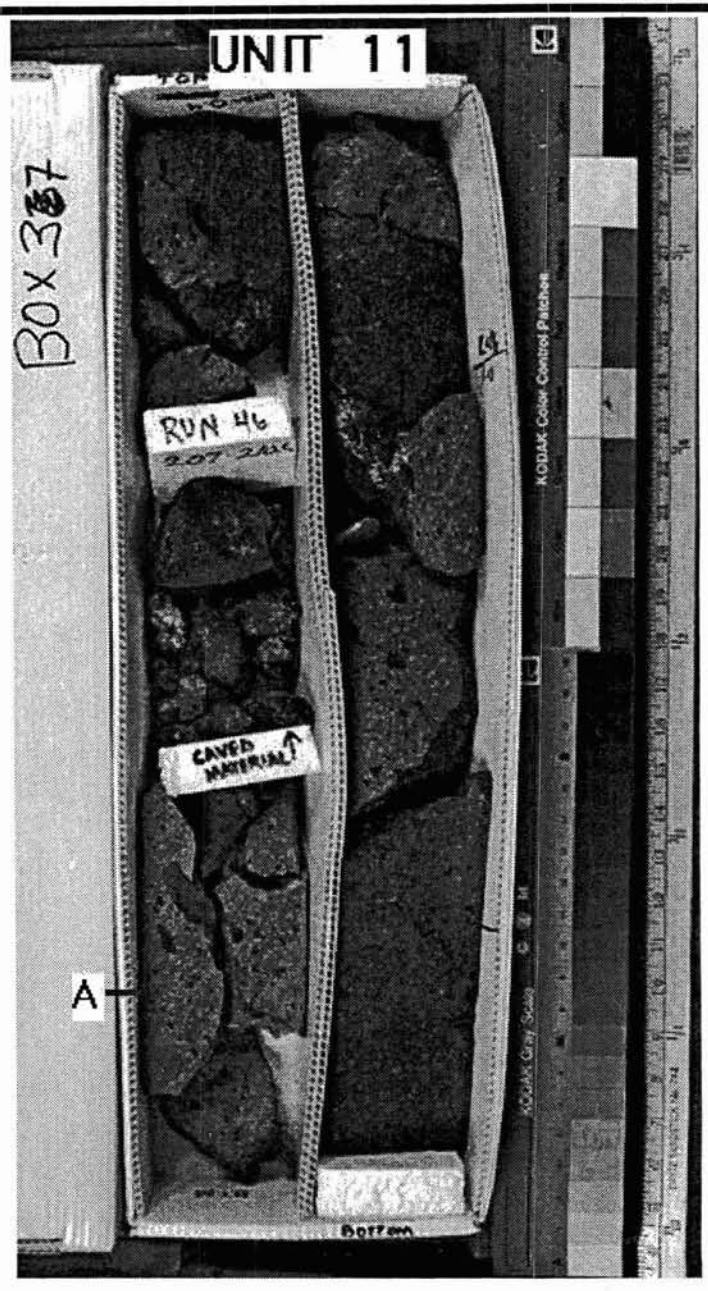
Loggers:	JCL
Date logged:	11/1/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	206.6
Driller's depth:bottom [feet]:	210.0
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:1 1

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 1-5 mm – equant to blocky –
1-7 mm, some clusters
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 5 mm – rounded-irregular – vertically elongated–
Variable elongation orientation. Diktytaxitic texture (?). 2 populations; large (~10 mm) irregular and small, 1 mm, round vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly to moderately fractured. Gray to brown to red discoloration of fracture surfaces.
Additional comments:
Cave material at top of R46. Core becomes less fractured and less discolored down-hole. A = Pyroxene-olivine inclusion, 12 mm, on fracture surface, hidden from view on photo, at R46-0.5.



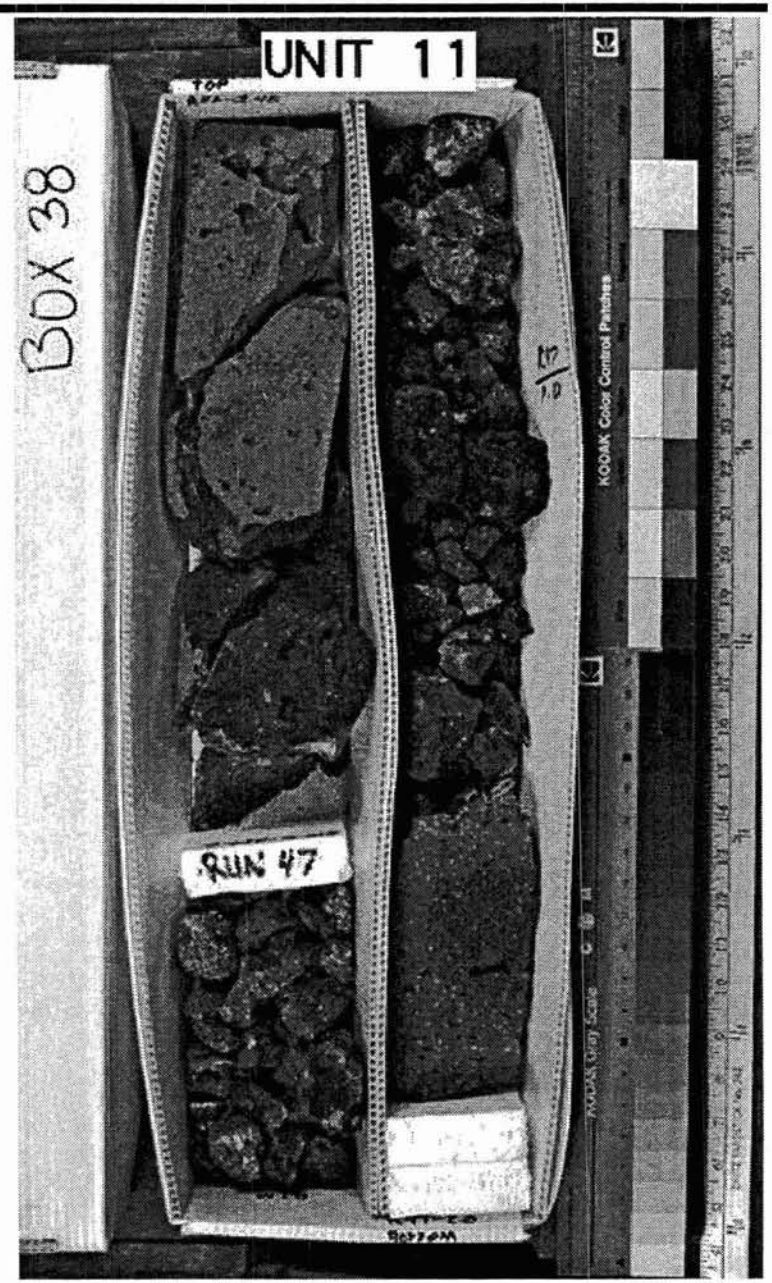
Box #:	Cores in box
38	46 47

Loggers:	JCL
Date logged:	11/1/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	210.0
Driller's depth:bottom [feet]:	213.0
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
cave and rubble from R47-0.0 to 1.5
Phenocrysts/Clasts:
moderately phyric (2-10%) – 200 pts. counted (8/100, 10/100)
olivine – 8-10% – 1-5 mm – blocky (<3:1:1) –
1-7 mm, spinel inclusions, some clusters
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 5 mm – irregular – sub-vertically elongate–
"pipe-type" irregularly shaped vesicles with diktytaxitic texture.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: moderate, excluding cave/rubble
Additional comments:
Olivine-pyroxene inclusions up to 10 mm. Yellow to dark brown discoloration of some fractures at bottom of R46 and rubble from top of R47. R47-0.0 to R47-1.5: rubbly with some cave material; some of the rubble was thick Fe-oxide coatings, some indication of surface textures, but not well developed; however, the vesicle population in the massive portion from R47-1.5 to R47-2.0 is not indicative of a flow top.



Box #:	Cores in box
39	47 48

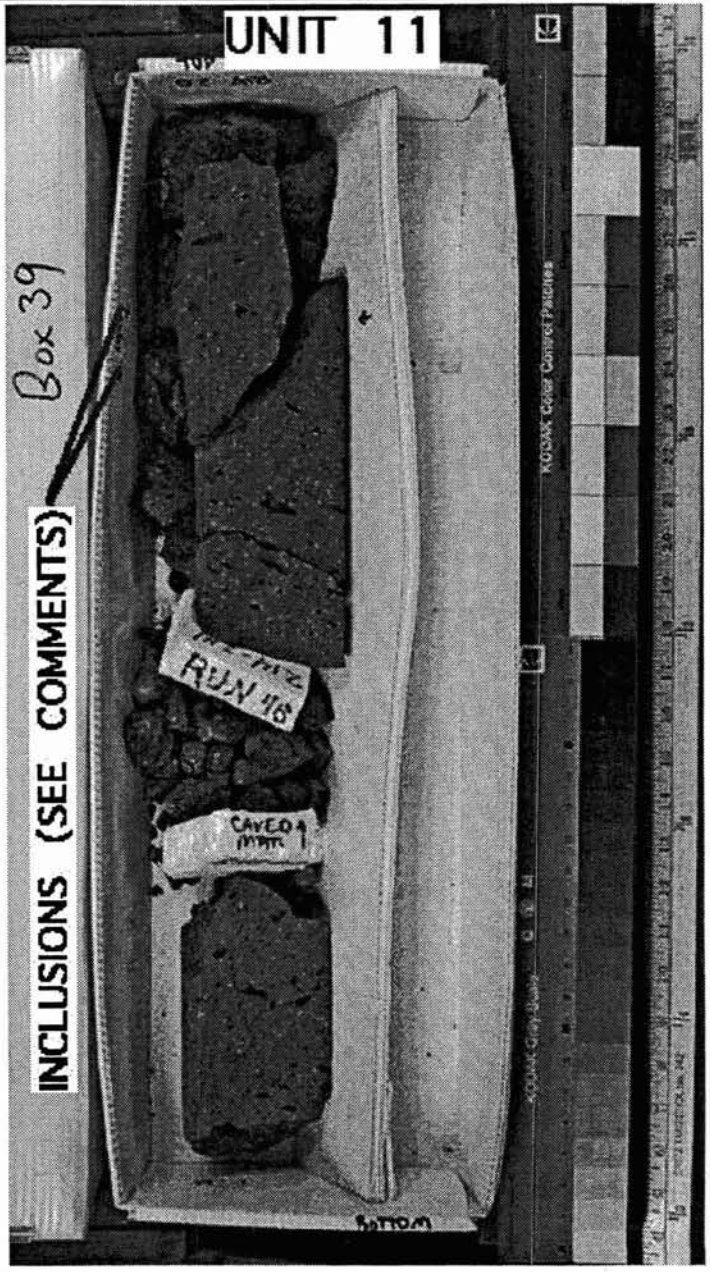
Loggers:	MBB
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	213.0
Driller's depth:bottom [feet]:	214.4
Core type:	PQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:11

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 2-5 mm – equant to blocky –
spinel inclusions; olivine crystal clots
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant to elongate –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: moderately to highly fractured
Additional comments:
2 inclusions (<4 mm) of olivine+pyroxene(?); locations marked on side of box (at R47-2.6) and on photo.



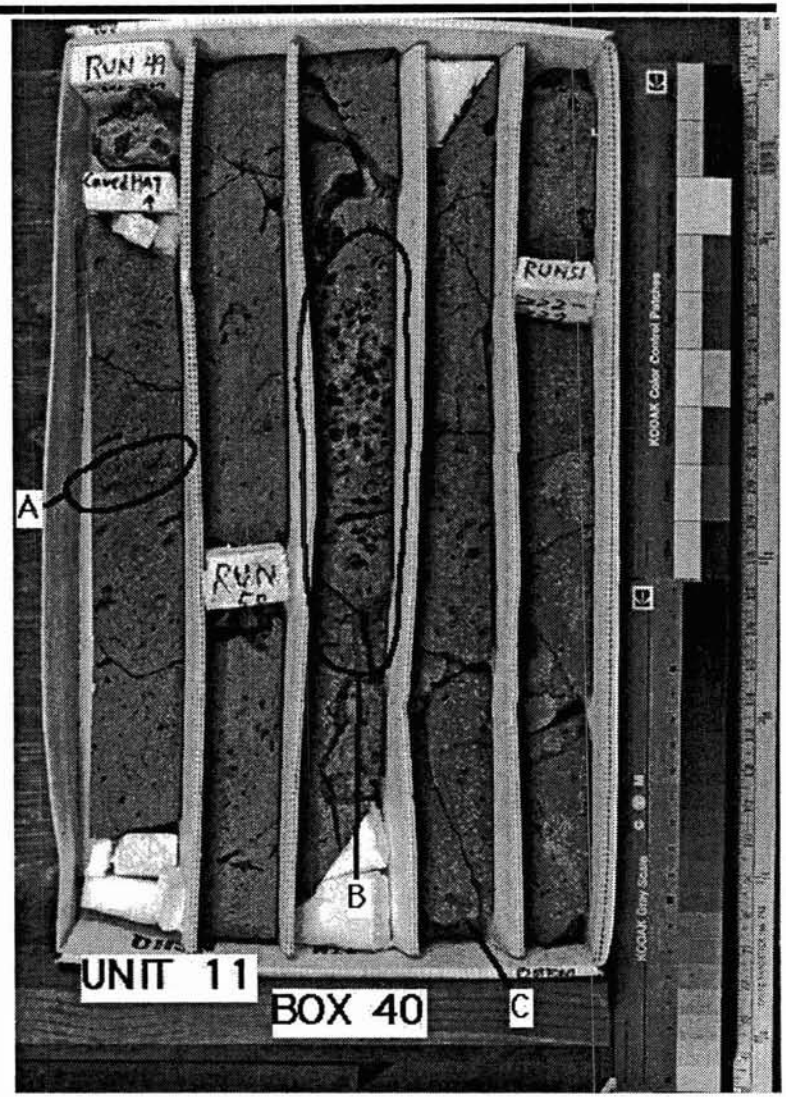
Box #:	Cores in box
40	49 50 51

Loggers:	BM
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	214.4
Driller's depth:bottom [feet]:	223.4
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant to blocky –
Size variation: <1 to 12 mm; spinel inclusions and crystal clots
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – horizontally elongated –
At "B", there is a zone of large (10-20 mm) vesicles grading to pipe vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured. At "C" there is a fracture coating consisting of zeolites(?) and Fe-oxides.
Additional comments:
This box is the start of the HQ series. The uppermost part of R49 contains cemented, caved material. Feature "A" is a lens of micro-vesicles which contain a concentration of coarse spinel (2-4 mm) grains. Feature "B" is a highly vesicular zone. NaCl ppt.



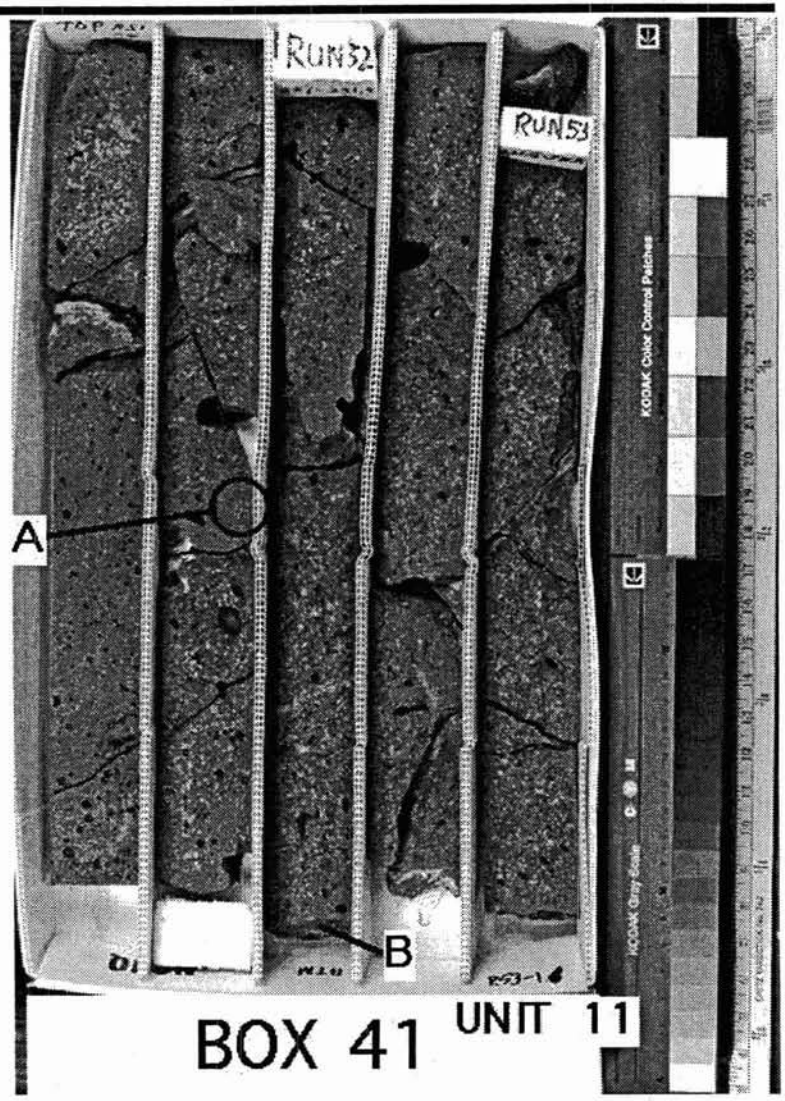
Box #:	Cores in box
41	51 52 53

Loggers:	JCL
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	223.4
Driller's depth:bottom [feet]:	232.9
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 1-5 mm – blocky (<3:1:1) –
rare spinel inclusions, multi-grain clusters
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – rounded – equant–
three populations: 1) small (<1 mm), equant; 2) medium (1-5 mm) slightly vertically elongate; 3) large (>5 mm) irregularly shaped to horizontally elongate. Some large (>10 mm) vesicles have diktytaxitic texture.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: slightly to moderately fractured, mostly subhorizontal (30-60°)
Additional comments:
A = large (2 cm) gabbroic clot with plagioclase and olivine. White or red-brown rinds on some fractures (e.g., B on photo). NaCl ppt.



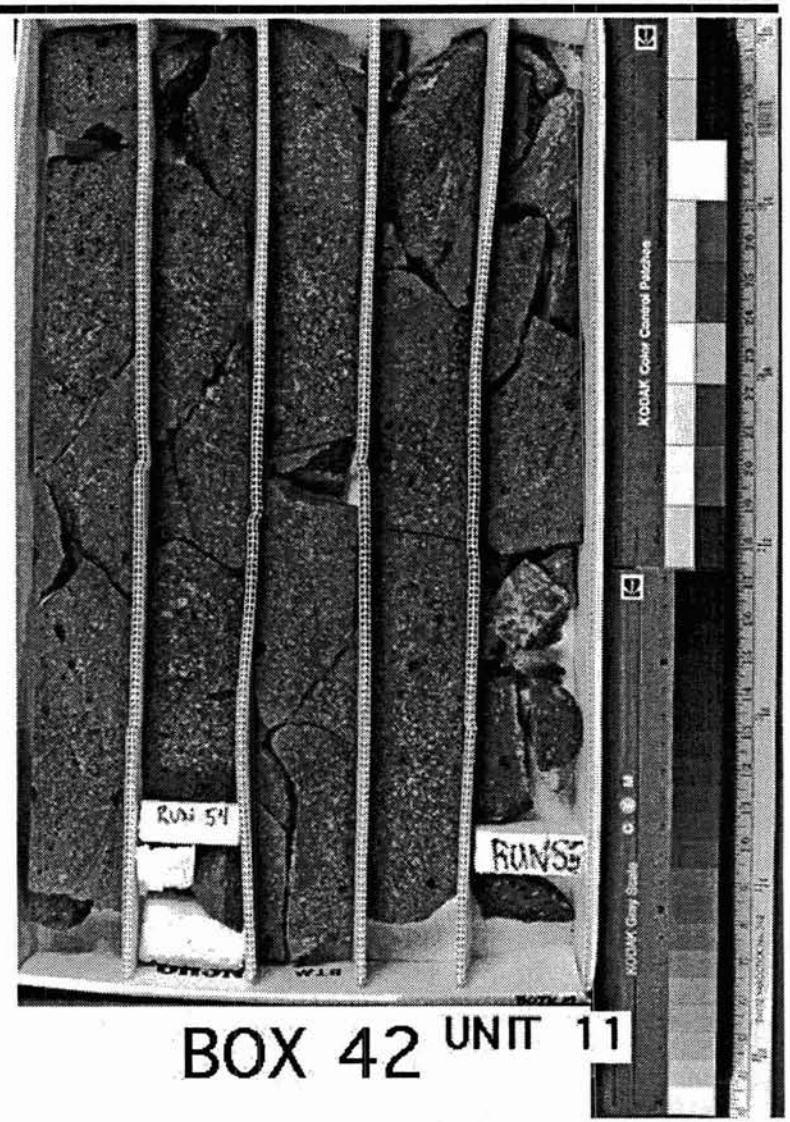
Box #:	Cores in box
42	53 54 55

Loggers:	JCL
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	232.9
Driller's depth:bottom [feet]:	241.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 1-5 mm – blocky (<3:1:1) –
many equant crystals; range: 1-8 mm; some spinel inclusions
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N2 grayish black – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1 mm – rounded – equant –
Two populations: 1) abundant sub-mm spherical vesicles and rarer larger (2-10 mm) vesicles often surrounded by concentrations of sub-mm vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: slight to moderate - horizontal, vertical, and inclined sets, some with yellow to white rinds
Additional comments:
<1% large (up to 4 mm) black (spinel?) inclusions; clinopyroxene-olivine inclusions



BOX 42 UNIT 11

Box #:	Cores in box
43	55 56

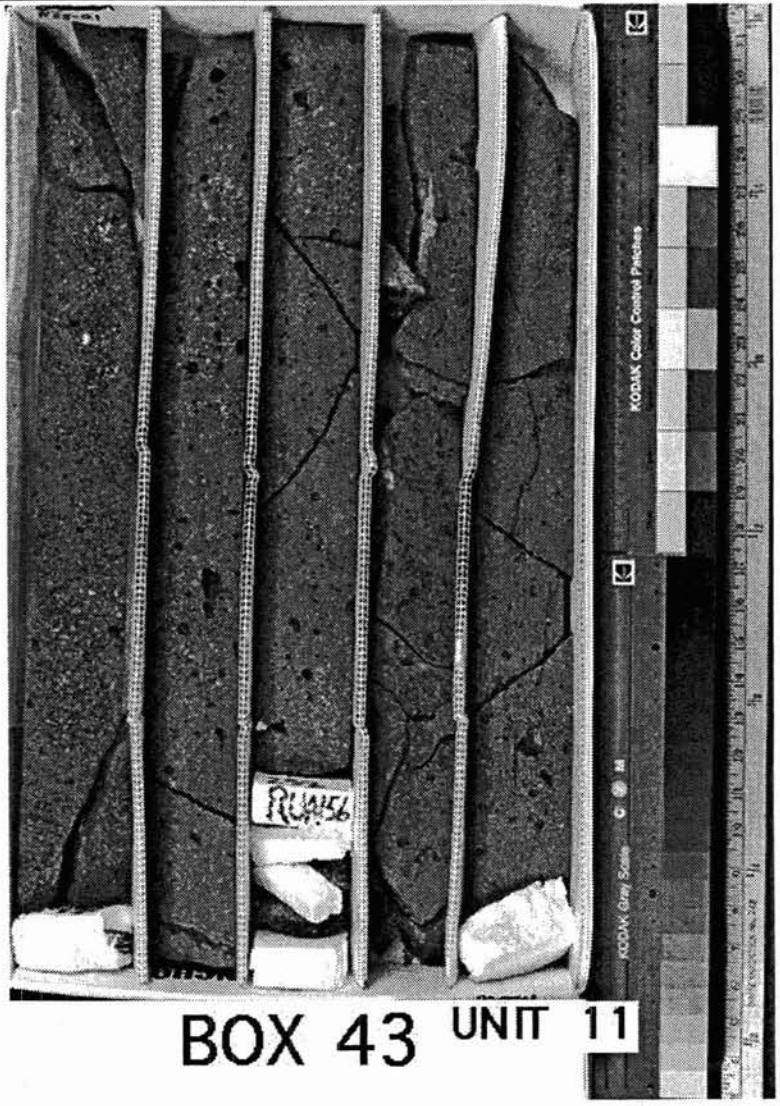
Loggers:	BM
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	241.6
Driller's depth:bottom [feet]:	250.8
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:1 1

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – – rounded – –
There are two populations of vesicles based on size: (1) a population <1 mm diameter and (2) a population >5 mm diameter.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured. Occasional fractures lined with clay.
Additional comments:



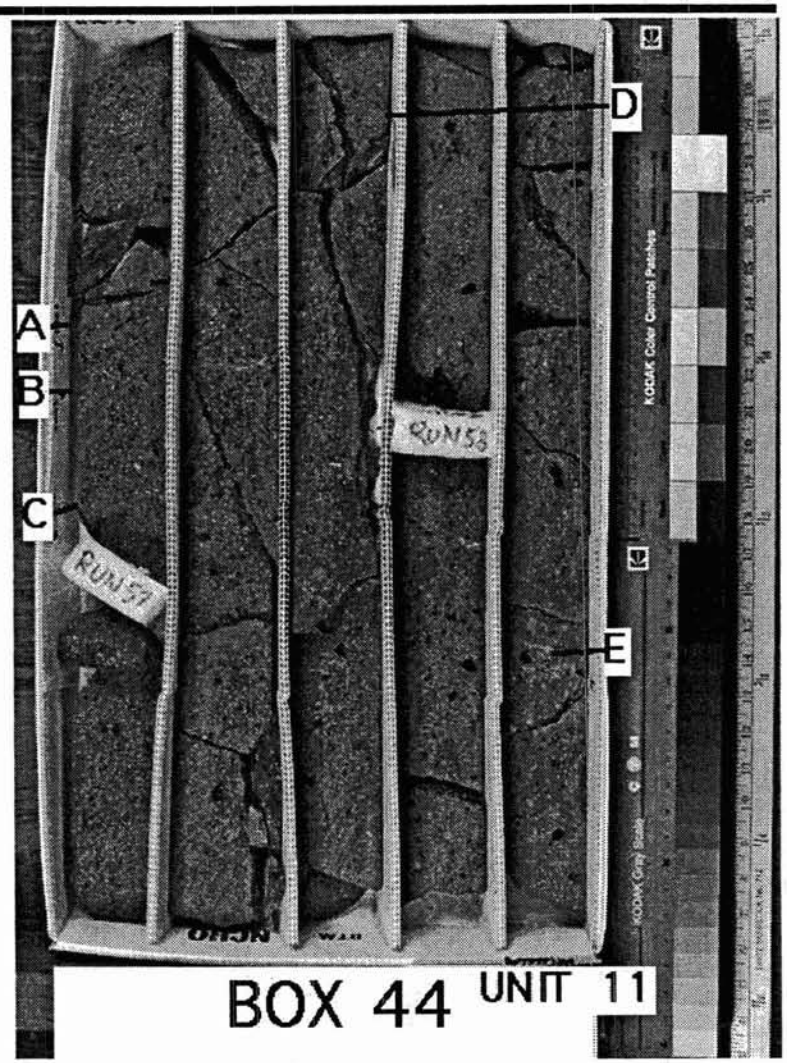
Box #:	Cores in box
44	56 57 58

Loggers:	MBB
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	250.8
Driller's depth:bottom [feet]:	259.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 2-4 mm – equant to blocky –
spinel inclusions; homogeneous olivine distribution; olivine clots
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1 mm & 5-10 mm – rounded to subrounded – equant to elongate –
Two populations; small vesicles sometimes occur in 10-20 mm long near-vertical trains.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured (20/8.9 ft)
Additional comments:
"A" = olivine+spinel+pyroxene(?) clot (~4 mm); "B" = gabbroic inclusion (~16 mm); "C" = gabbroic inclusion (~11 mm); "D" = olivine+spinel clot (~15 mm); "E" = gabbroic inclusion. The gabbroic inclusions have a quench-like texture (elongate plagioclase laths) and are quite vesicular.



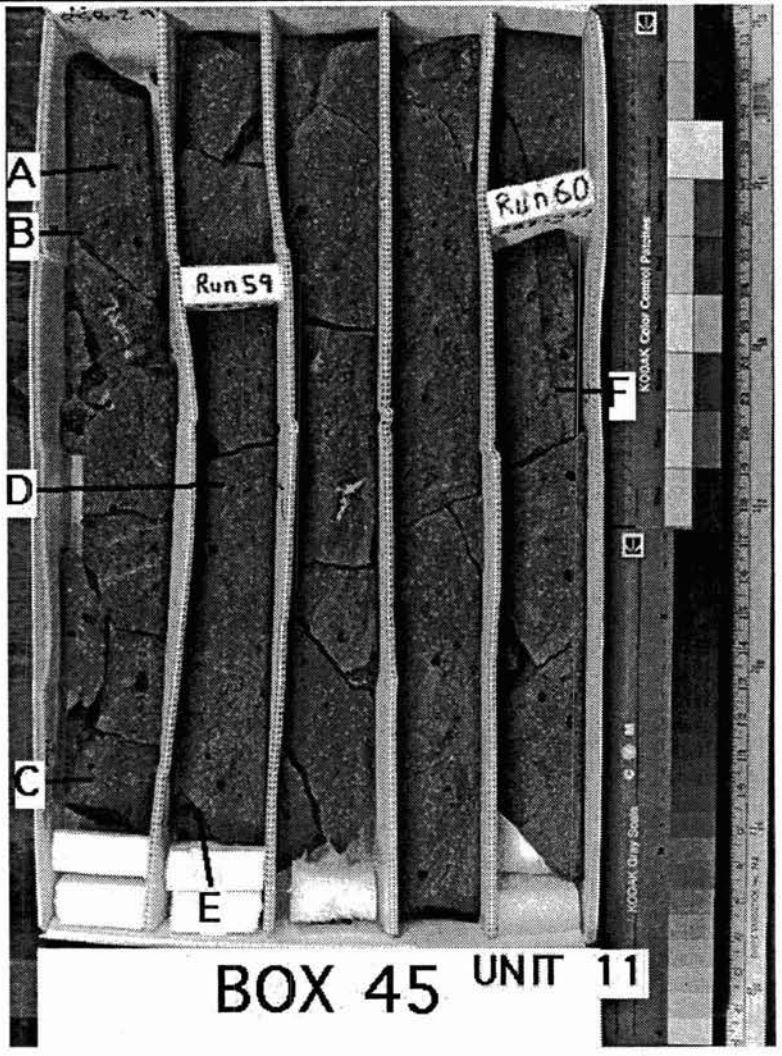
Box #:	Cores in box
45	58 59 60

Loggers:	MBB
Date logged:	11/2/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	259.7
Driller's depth:bottom [feet]:	268.3
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:11**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 2-4 mm – equant to blocky –
spinel inclusions; olivine clots; homogeneous olivine phenocryst distribution
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: <5% – <1 mm; 5-10 mm – rounded; subrounded – –
two populations; elongate vesicles have no preferred orientation
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured (18/9.4 ft)
Additional comments:
Refer to photo: "A" = olivine+pyroxene(?) clot (~5 mm) at R58-3.2, appears to be infilled by groundmass; "B" = vesicular "microgabbroic" inclusion at R58-3.45; "C" = vesicular "microgabbroic" inclusion at R58-4.5; "D" = vesicular "microgabbroic" inclusion; "E" = vesicular "microgabbroic" inclusion; "F" = olivine+spinel in a granular feldspathic(?) matrix.



Box #: 46

Cores in box: 60, 61

Loggers: JCL
Date logged: 11/2/93
Checked by: MG
Check date: 11/4/93

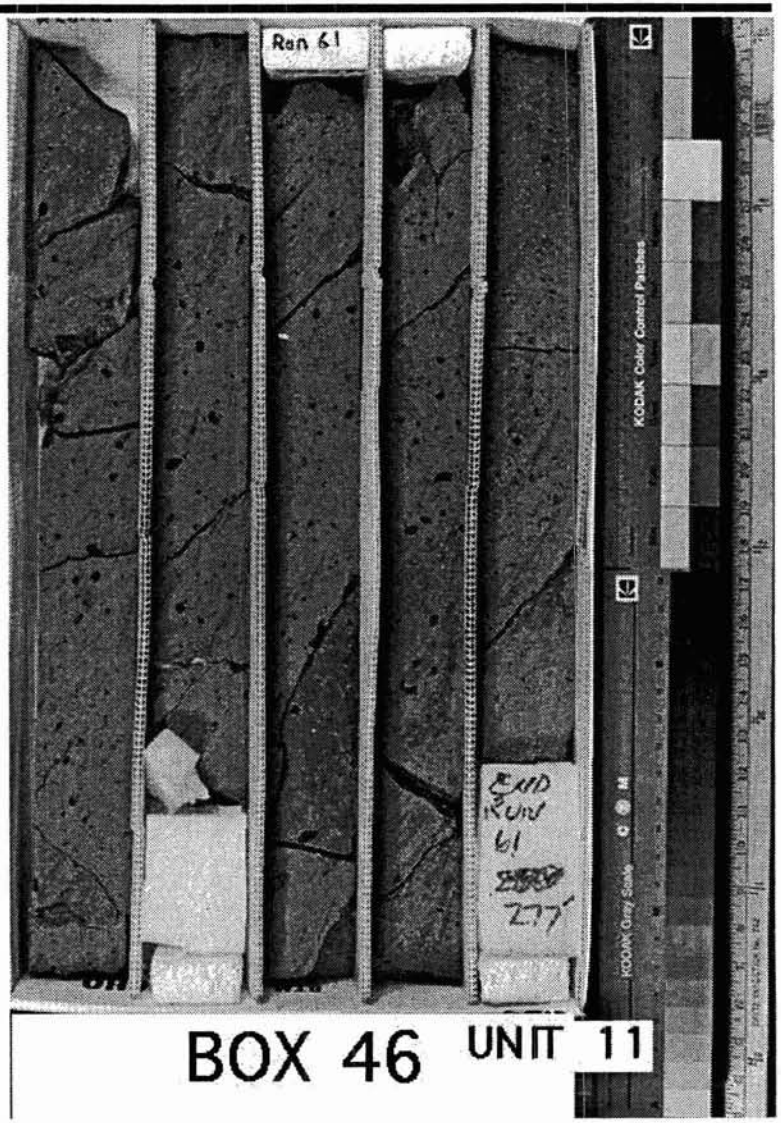
Driller's depth:top [feet]: 268.3
Driller's depth:bottom [feet]: 277.0
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #: 11

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-10% – 4-6 mm – blocky (<3:1:1) –
1-10 mm, some spinel inclusions, multi-grain clots
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N2 grayish black – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 5 mm – sub-rounded – irregular to inclined-elongate –
1-2 cm horizontal lenses of micro-vesicles also present
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured – 0 to 60°
Additional comments:
2 to 5 mm olivine-plagioclase and olivine-clinopyroxene inclusions, some with vesicles.



Box #:	Cores in box
47	62 63

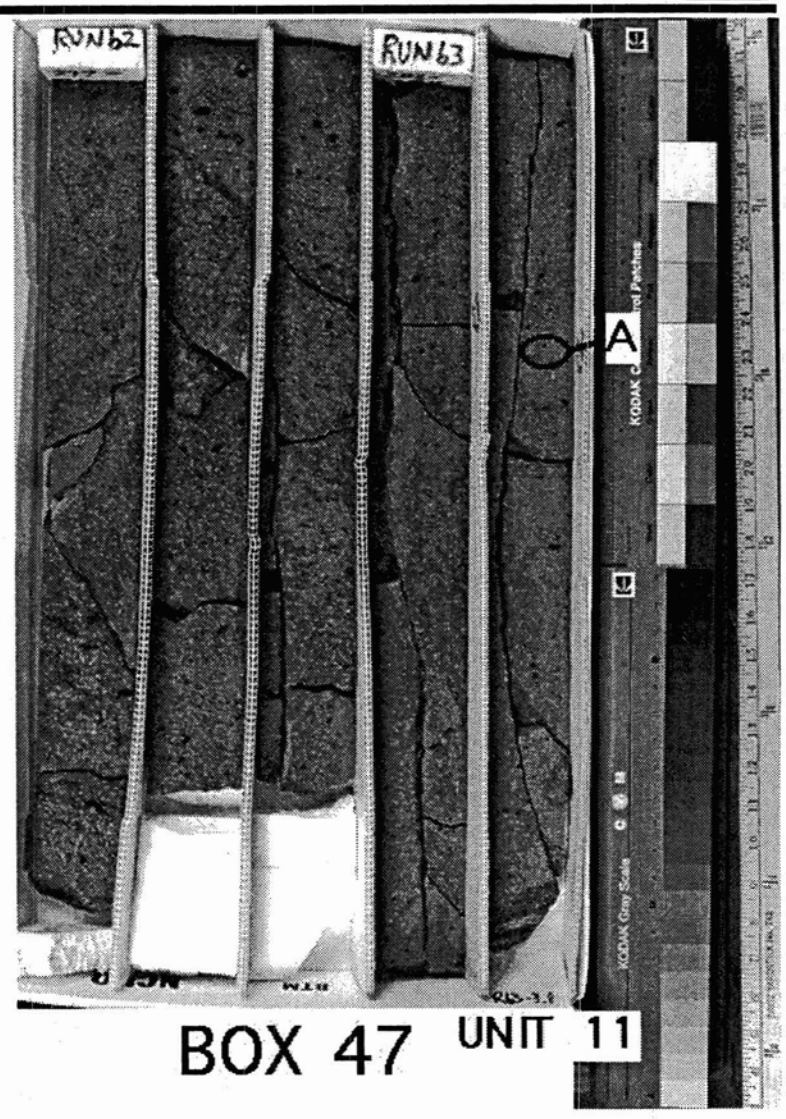
Loggers:	BM
Date logged:	11/3/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	277.0
Driller's depth:bottom [feet]:	285.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:1 1

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant to blocky –
Spinel inclusions in olivine; several crystal clots present; variation in grain size from <1 to 8 mm.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded – horizontally elongated–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 18/8.6 ft
Additional comments:
Feature "A" is an olivine-clinopyroxene crystal clot (11 mm long).



BOX 47 UNIT 11

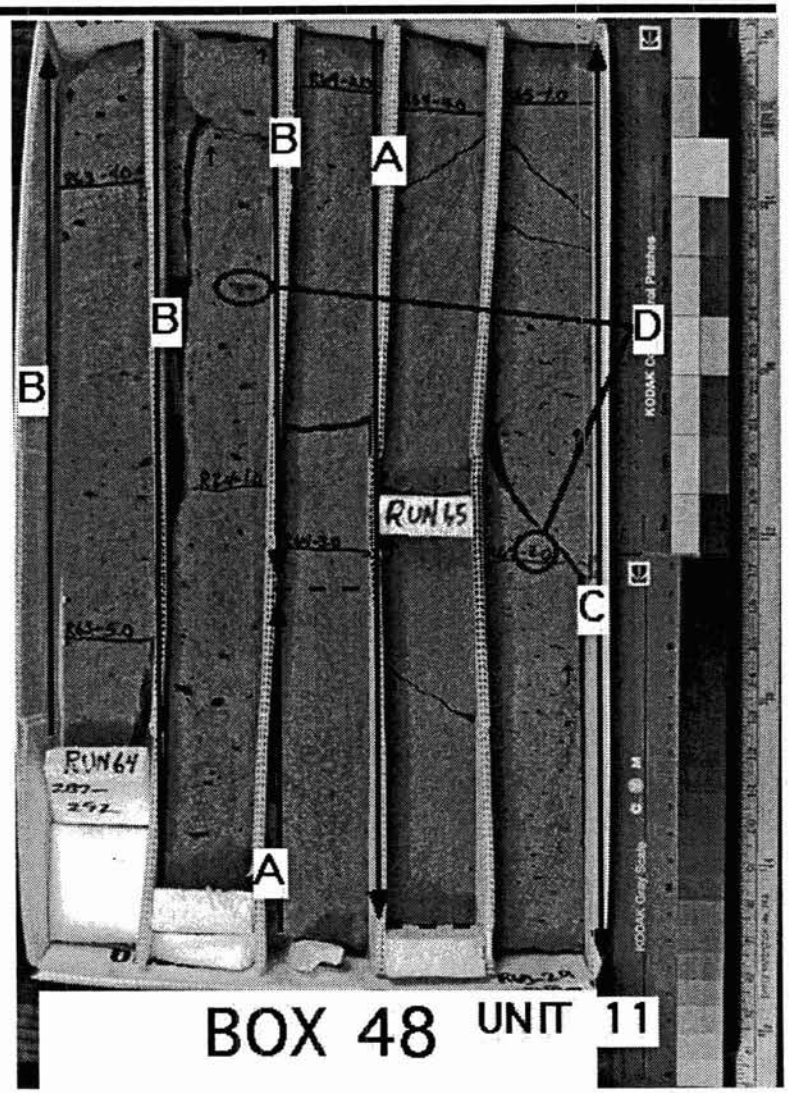
Box #:	Cores in box
48	63 64 65

Loggers:	BM
Date logged:	11/3/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	285.6
Driller's depth:bottom [feet]:	294.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:1 1**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – – –
200 point counts made at 3 zones: Top zone "B" contains 15% olivine; Central zone "A" contains 18-21% olivine; Bottom zone "C" contains 12-13% olivine.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% – – – –
Vesicles were point counted. Zone "A":<1% vesicles; Zone "B":1-5%, 7 mm, rounded, horizontally elongate; Zone "C": 1-5%; subrounded to subangular, horizontally elongated with aspect ratio of ca. 5:1.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 8/8 ft
Additional comments:
Zone "A" is olivine-rich (18-21%), and is a possible cumulate zone. Zone "A" is transitional to zones "B" and "C" which have between 12-15%. Zone "A" is also distinct in its lack of vesicles. Zone "C" vesicles are strongly sheared perpendicular to core axis. Zone "B" is only moderately sheared. There is an olivine-clinopyroxene crystal clot at "D".



Box #:	Cores in box
49	65 66 67

Loggers:	BM
Date logged:	11/4/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	294.7
Driller's depth:bottom [feet]:	304.0
Core type:	HQ
Units in box:	3

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 11

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R65-4.6-297.4')(flow contact)
Underlain by volcaniclastic siltstone. There is no chilled margin between the basalt and the siltstone. The contact is irregular and dips 45°.

Unit type: massive

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
Point counting of 100 points gave a mode of 12%. This unit has a homogeneous distribution of olivine. Maximum size of olivine is 8 mm. Spinel inclusions in olivine.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N3 dark gray – **Structures:** – **Sorting:** –

Vesicles: <5% – 1-5 mm – sub-rounded to sub-angular – horizontally elongated –

Alteration: fresh (<2% altered) –

Veins: none

Fractures: weakly fractured: 1/1.7 ft

Additional comments:
Unit 1 is continuous with zone "C" in Box 48, but vesicle size is smaller towards the base of this unit. Feature "A" is an olivine-clinopyroxene crystal fragment. Bottom of this unit is unusual in not having a glassy base. The bottom contact is irregular.

BOX UNIT 2: lithic to vitric volcaniclastic silt — UNIT #: 12

Contacts: Top (ft): (R 65-4.6-297.4')(flow bottom/sediment contact)
Bottom (ft): (R65-5.1-297.9')(sedimentary/flow contact)

Unit type:

Phenocrysts/Clasts:
–
glass shards – – – –
also crystal fragments (magnetite)
volcanic clasts – – – –
shell fragments – – – –
also calcareous microfossils?. The working core portion has a bivalve shell fragment within an open vesicle in the underlying basalt contact with this siltstone unit.

Groundmass/Matrix: –

Color: brownish gray 5YR 4/1 – **Structures:** unbedded – **Sorting:** well-sorted –

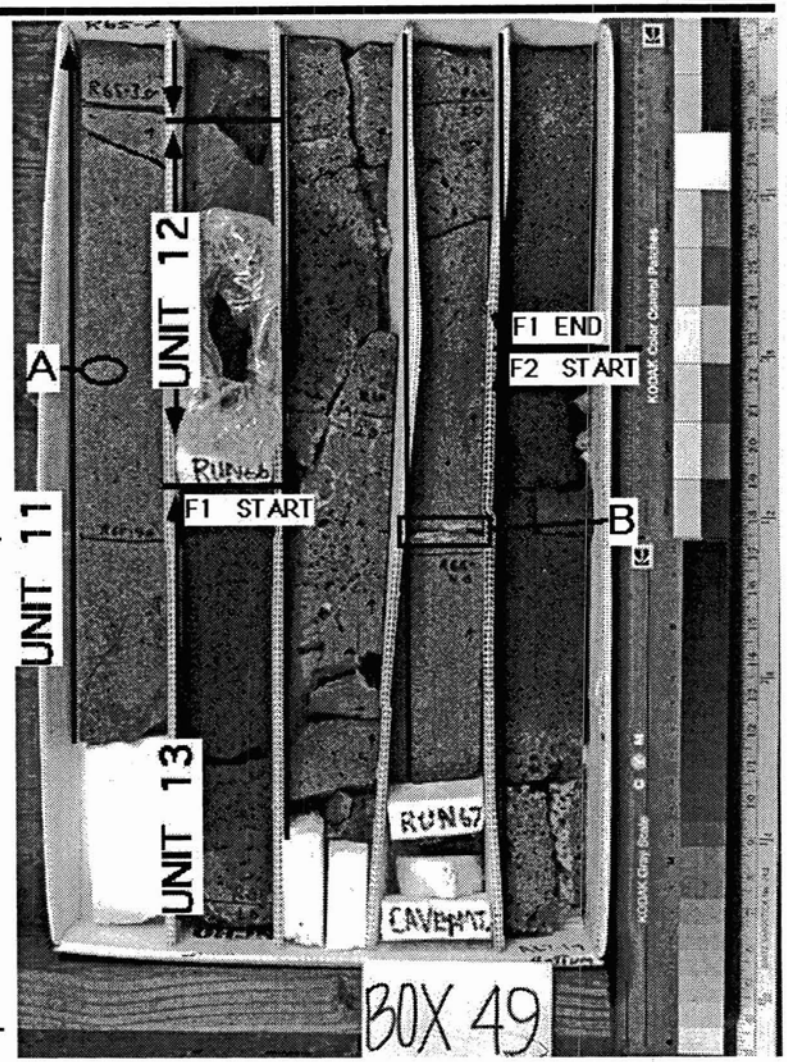
Vesicles: – – – –

Alteration: –

Veins: none

Fractures: none

Additional comments:
upper half of layer is gray and appears to be an ash, but the bottom half is a brown sand-silt with coral fragments and microfossils common (WRC 12/1/93)



BOX 49 CONTINUED ON NEXT PAGE

Box #:	Cores in box
49	65 66 67

Loggers:	BM
Date logged:	11/4/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	294.7
Driller's depth:bottom [feet]:	304.0
Core type:	HQ
Units in box:	3

BOX UNIT 3: moderately olivine phyric basalt **UNIT #: 13**

Contacts: Top (ft): (R 65-5.1-297.9')(flow top pahoehoe)
Bottom (ft): (R--')(continuous with next)

Unit type: pahoehoe
highly vesicular top

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant –
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray– **Structures:** – **Sorting:** –

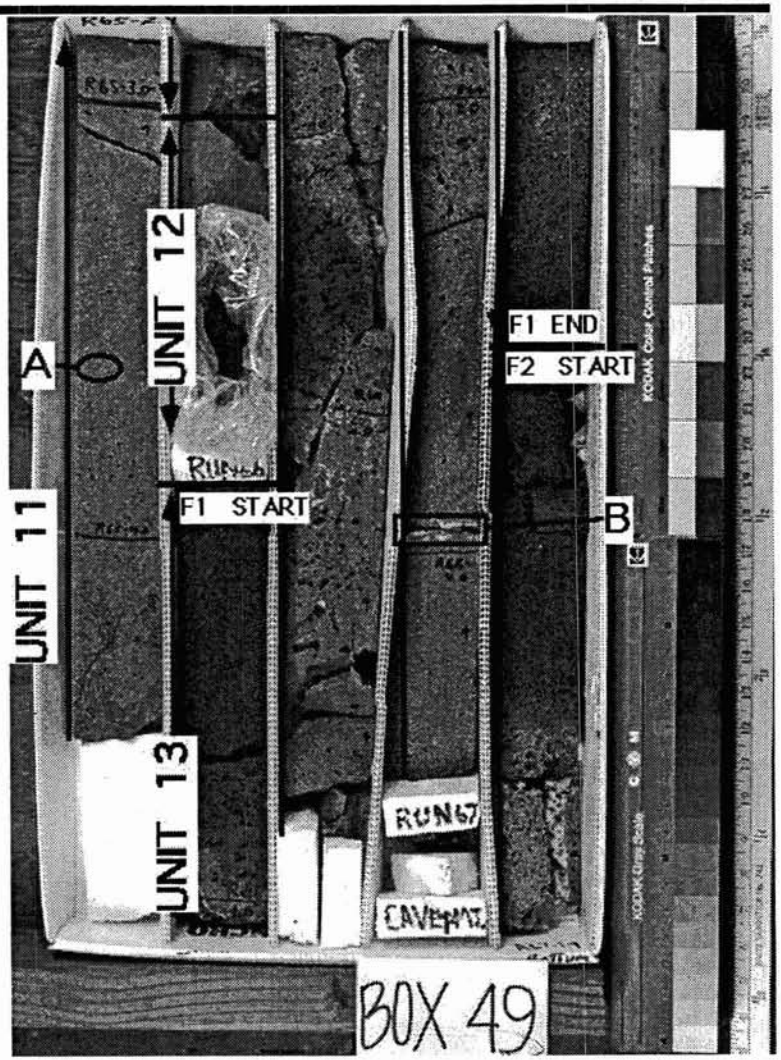
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant to horizontally elongated–

Alteration: fresh (<2% altered) –
slightly oxidized (hematite?) at uppermost 0.3' of flow

Veins: none

Fractures: weakly fractured: 10/10 ft

Additional comments:
This box contains 2 flows in box unit 3: the uppermost flow (F1) is 5.3' thick. In this flow, the uppermost 0.7' is highly vesicular(15-25%) with small vesicles (<5 mm) and contains <5% olivine. The next 2.3' also contains <5% olivine, but there are fewer (? EMS) vesicles (10-15%), and they are larger (5-15 mm). The lowermost 2.3' contains an olivine-rich (20-30%) cumulate zone, which contains <5% vesicles. From R67-0.7 to the bottom of the box a second flow (F2) is present.
Feature "B" is a horizontal lens (vesicle infilling?), 9 mm thick, which contains an infilling of clay and altered and oxidized fragments of <0.1 mm diameter. There are fine horizontal laminae at the bottom of this feature.
Special note: A bivalve shell fragment is contained within a vesicle in the uppermost portion of this unit, at the top of the core.



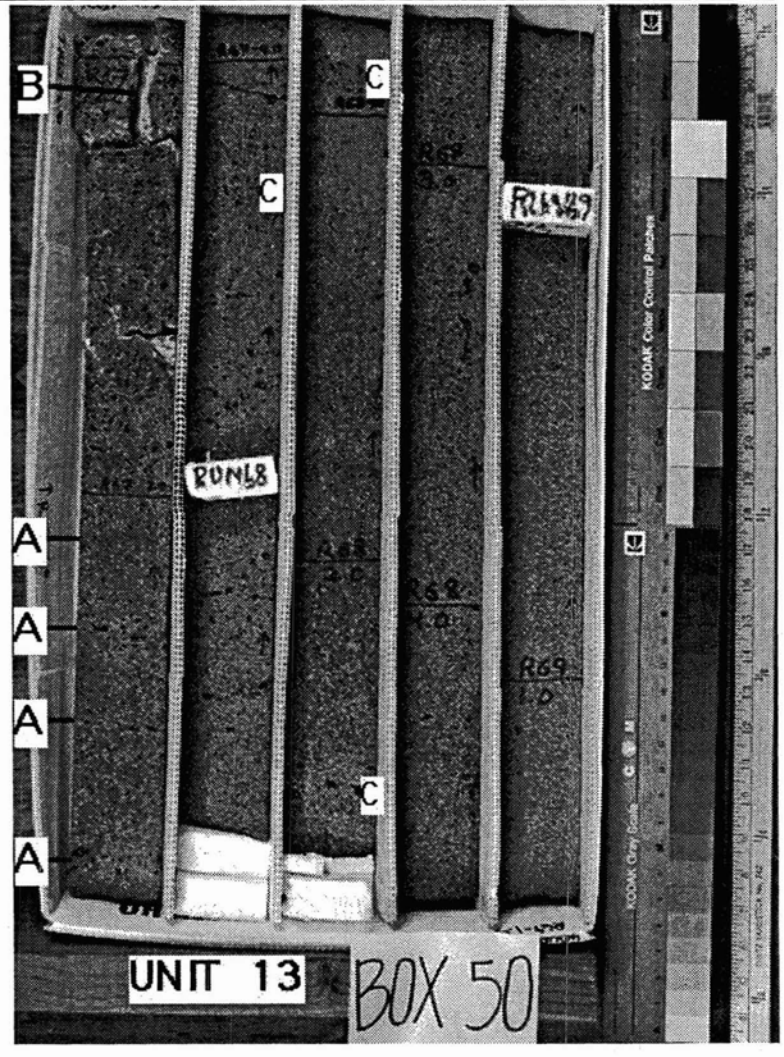
Box #:	Cores in box
50	67 68 69

Loggers:	MBB
Date logged:	11/3/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	304.0
Driller's depth:bottom [feet]:	314.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:1 3**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
Olivine <15% in the interval R67-1.9 to R67-2.6; point counting slabbed surface at R68-1.7 gave ~33% olivine, representative of most of the core in the box. Olivines are uniform in size.
– – – –
– – – –
Groundmass/Matrix: microcrystalline above R67-2.6; fine-grained (<1 mm) – groundmass consists of microcrystalline material + plagioclase laths + clinopyroxene(?) below
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 15-30% – <1 mm and 2-4 mm (see comments) – – –
Above R67-2.6, vesicles are 2-4 mm, rounded and 20-30%. Below R67-2.6 most vesicles are <1 mm, subangular and 15-20%. Rare large subrounded and elongate vesicles are >20 mm.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured (6/9.5 ft). Fractures in the zone R67-1.9 to R67-2.8 (labeled "B" on photo) have a faintly yellow coating with rare filaments (biological?).
Additional comments:
Horizontal layers of aphyric microcrystalline less vesicular basalt (labeled "A" on photo). "C" = more diffuse, coarsely vesicular microcrystalline zones. Both "A" and "C" zones contain miarolitic cavities.



Box #:	Cores in box
51	69 70 71

Loggers:	JCL, MG
Date logged:	11/3/93
Checked by:	MG
Check date:	11/4/94

Driller's depth:top [feet]:	314.1
Driller's depth:bottom [feet]:	323.7
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt **UNIT #: 13**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R69-3.7-316.2')(flow contact)
oxidized, highly vesicular unit below; fluid texture at base
Unit type: massive
pahoehoe bottom contact - highly vesicular, some altered glass, almost a ropy texture
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – <1 mm – sub-rounded – equant–
Up to several cm, irregular, vertically elongate, larger up to R69+3.0', then smaller until contact.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured, red discoloration on some surfaces, subhorizontal to 60°
Additional comments:

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 14**

Contacts: Top (ft): (R 69-3.7-316.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
red, vesicular top (noted in photo)
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 13-15% – 1-2 mm – blocky-equant –
200 pts counted; rare large (1 cm) olivines; mild iridescence on fractures
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: red at top; med. dk. gray– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 3 mm – irregular – 1:1 to 2:1–
size increases downward
Alteration: slightly (2-10% altered) –
top ~20 cm oxidized; clay-like material along some fractures
Veins: none
Fractures: weakly to moderately fractured
Additional comments:
A = open textured gabbro (4.5 cm)
B = olivine+clinopyroxene inclusion (1 cm)

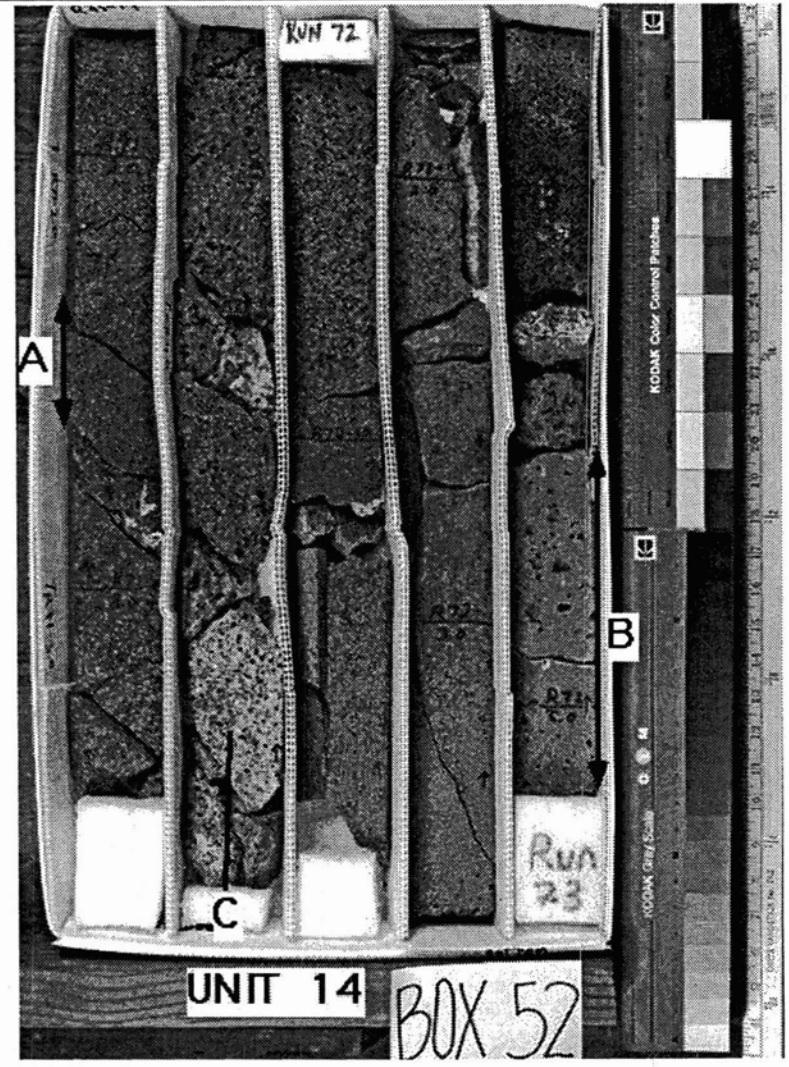
Box #:	Cores in box
52	71 72

Loggers:	MBB
Date logged:	11/4/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	323.7
Driller's depth:bottom [feet]:	332.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately to highly olivine phyric basalt **UNIT #:1 4**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately to highly phyric (2->10%) –
olivine – 9-11% – 1-5 mm – equant to blocky –
At R71-3.0 olivine = 11%; at R72-3.0 olivine = 9% (Both measurements based on point counting a slabbed surface). Spinel inclusions present in olivines. Wide distribution in olivine sizes (some >5 mm).
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm; some up to 10 mm – rounded to subrounded – equant to elongate–
Vesicle size and proportion varies throughout section: "A" = zone of <1 mm vesicles; "B" = zone of large (>10 mm) subrounded to subangular vesicles (<10%).
Alteration: fresh (<2% altered) –
Veins: none
Fractures: moderately fractured (26/8.5 ft); pale yellow coating on fractures throughout section (well displayed at "C", see photo)
Additional comments:



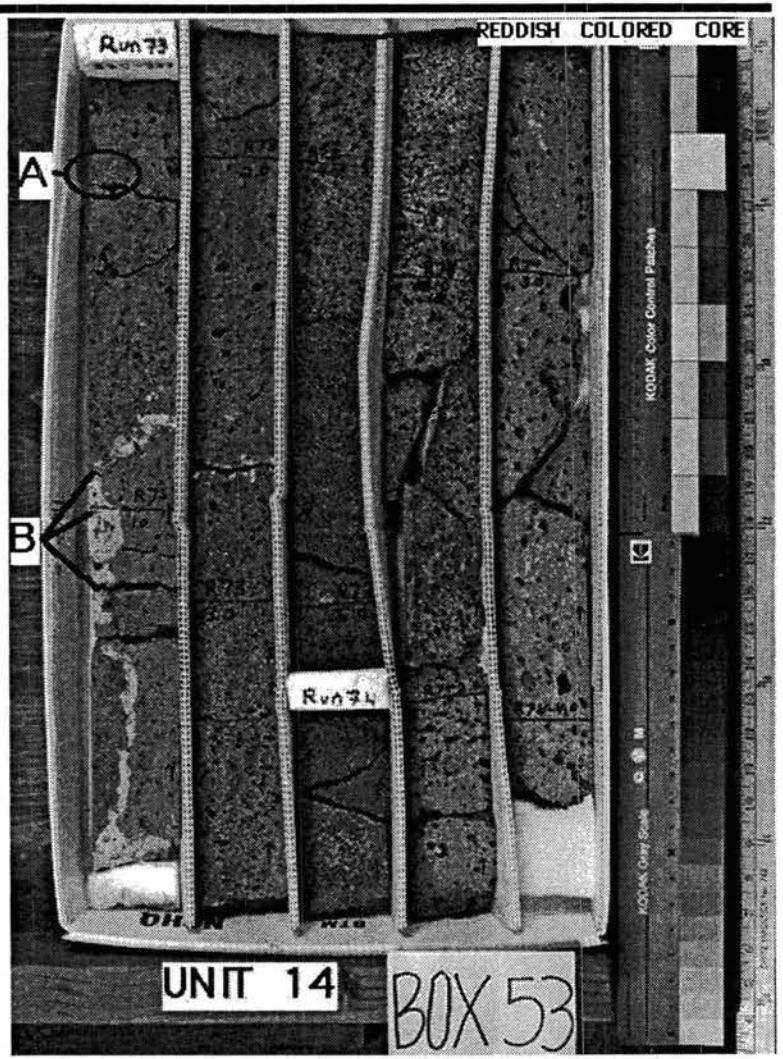
Box #:	Cores in box
53	73 74

Loggers:	BM
Date logged:	11/4/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	332.0
Driller's depth:bottom [feet]:	341.3
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:14**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant to blocky –
Size variation: <1 to 7 mm.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R6/2 pale red to N4 med. dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – spherical to subrounded – equant to horizontally elongated –
variable: from 1-30 mm
Alteration: slightly (2-10% altered)? –
Olivines have a black, iridescent coating (Mn-oxides) along fractures. Unfractured olivine cores are unaltered. Microcrystalline matrix has reddish color.
Veins: none
Fractures: Weakly fractured: 22/9 ft. Fractures at "B" are lined by a yellowish clay with a filamentous texture.
Additional comments:
Feature "A" is an olivine-clinopyroxene-plagioclase xenolith. Crystals of clinopyroxene and olivine are contained within a feldspathic matrix.



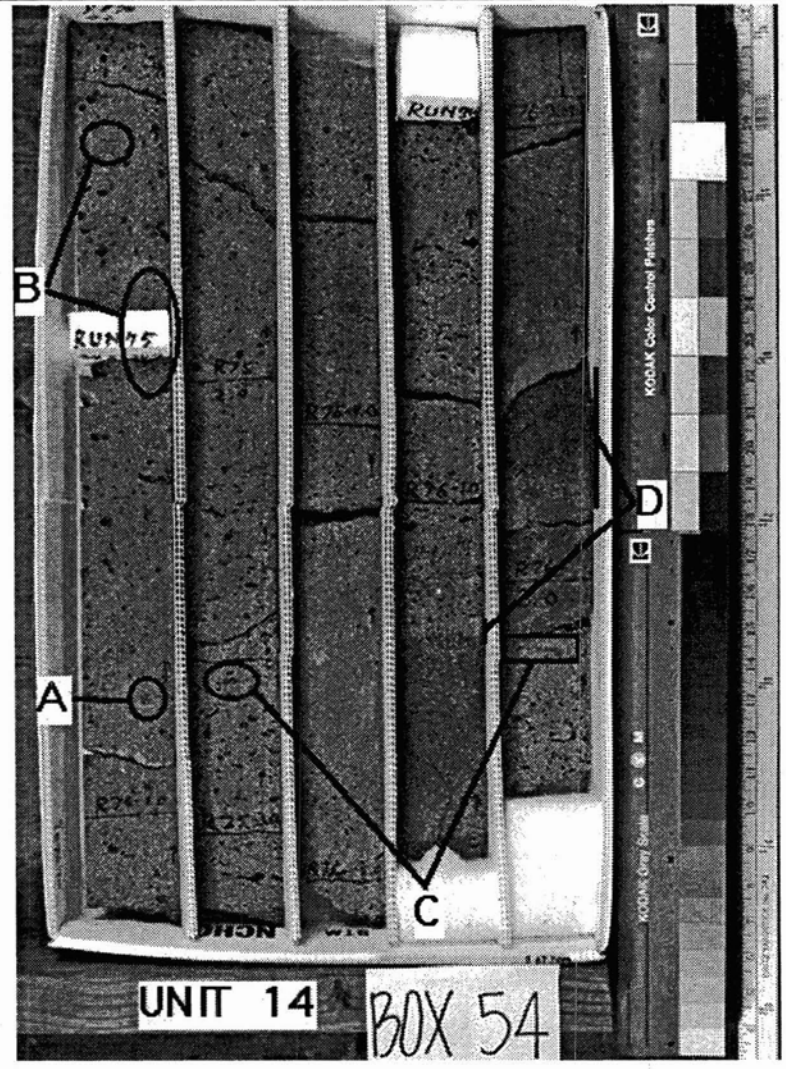
Box #:	Cores in box
54	74 75 76

Loggers:	BM
Date logged:	11/4/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	341.3
Driller's depth:bottom [feet]:	350.2
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:14**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant to blocky –
Variation in size: <1 to 8 mm. Two point counts of 100 points gave modes of 2 and 10%.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R6/2 pale red to medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – spherical to sub-angular – equant to horizontally elongated –
Variation in size from 1-22 mm. "C": Vesicle infillings noted in 2 (rare) instances, with the infilling consisting of oxidized, cemented sugary grains of unknown composition.
Alteration: slightly (2-10% altered) – iddingsite
Olivines have a black, iridescent coating (Mn-oxides) along fractures. Some are iddingsitized. Unfractured olivine cores are unaltered.
Veins: none
Fractures: weakly fractured: 13/9 ft
Additional comments:
Feature "A" is an altered olivine-clinopyroxene crystal clot. Feature "B" is a clinopyroxene-olivine crystal clot in a feldspathic matrix. Features labeled "D" are two zones of highly vesicular lava. Vesicles are small (1-2 mm) and round.



Box #:	Cores in box
55	76 77 78

Loggers:	MBB
Date logged:	11/4/93
Checked by:	MG
Check date:	11/10/93

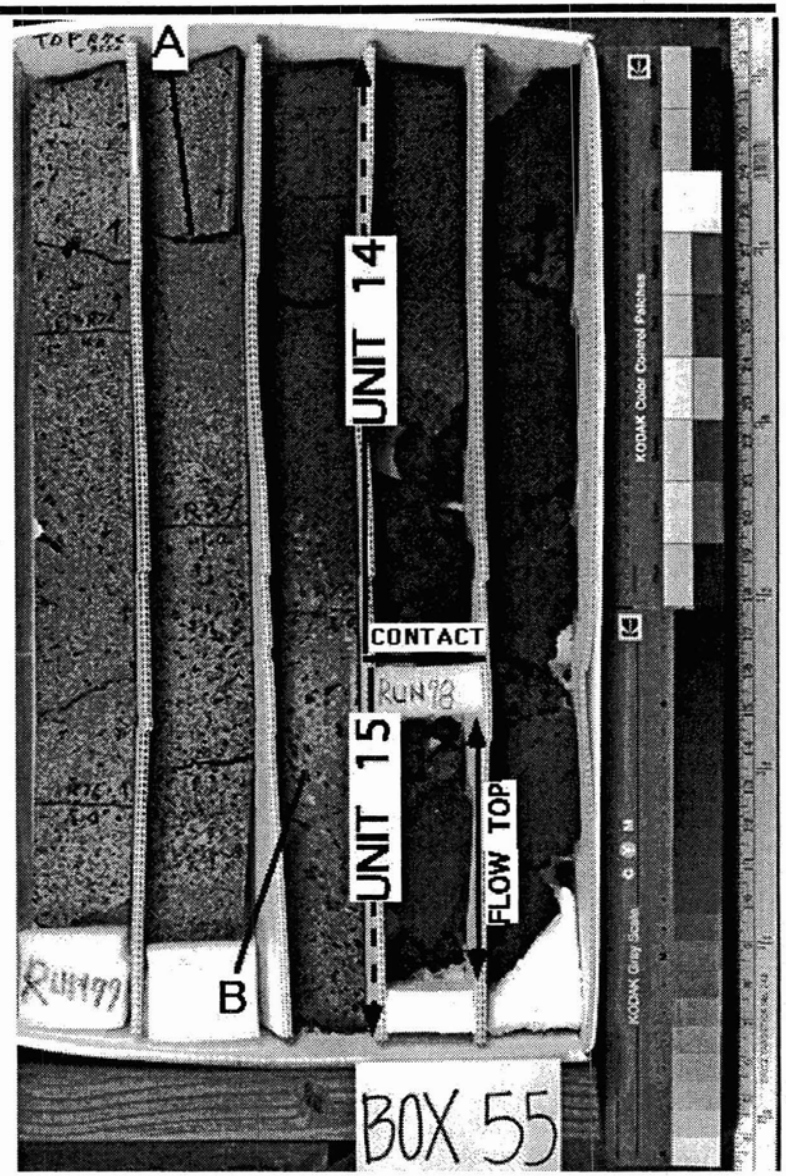
Driller's depth:top [feet]:	350.2
Driller's depth:bottom [feet]:	359.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 14

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R77-5.0-357.3')(flow contact)
Highly vesicular zone and ropy textures define flow bottom
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
point counts: 18% at R76-4.6; 16% at R77-1.7. Iridescent coatings (rims in cross-section) on some grains (manganese oxide?); some grains are partially iddingsitized. Some grains are up to 10 mm in longest dimension.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: 5-20% – 1-10 mm – subrounded to subangular – equant –
There appear to be two generations of vesicles - in zone "A" (see photo) highly sheared vesicles are adjacent to subrounded ones. Vesicle surfaces have red (Fe-oxide) coatings.
Alteration: see comments –
Groundmass has reddish tint (oxidation?); more noticeable in the zones that contain abundant <1 mm vesicles.
Veins: none
Fractures: weakly fractured: 9/6.3 ft
Additional comments:
"B" = zone where elongate vesicles define a circular flow pattern; rare gabbroic inclusions, open-textured.

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 15

Contacts: Top (ft): (R 78-0.0-357.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
flow top defined by highly oxidized and vesicular material (scoriaceous)
Unit type: transitional
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-4 mm – equant to blocky –
point counts: 20% at R78-2.0; in cross-section olivines are partially (rimmed) to completely oxidized. Material is dull black - MnO (?).
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: >30% – <1 mm – sub-rounded – equant to elongate –
Alteration: highly (40-80% altered) - oxidized –
Veins: none
Fractures: zone is rubbly
Additional comments:
rare gabbroic inclusions



Box #:	Cores in box
56	78 79 80

Loggers:	BM
Date logged:	11/4/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	359.0
Driller's depth:bottom [feet]:	368.4
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:15**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
This box contains 2 flows (F1 and F2), with F1 in this box from R78-2.1 to a flow contact at R78-4.8. F2 is from R78-4.8 to end of box. The flow contact dips at 30° and is irregular.

Unit type: transitional
F1 is scoriaceous. F2 is highly vesicular in the upper portion of the flow to massive.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky – iddingsite (minor)
Three point counts of 100 points each at 1, 2 and 3 on photo, gave modes of 15, 18 and 20%, respectively. Fractures on olivine are coated with a black, iridescent material (Mn-oxide?).
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 med. gray. Scoria fragments are 5YR 3/4 pale red. – **Structures:** – **Sorting:** –

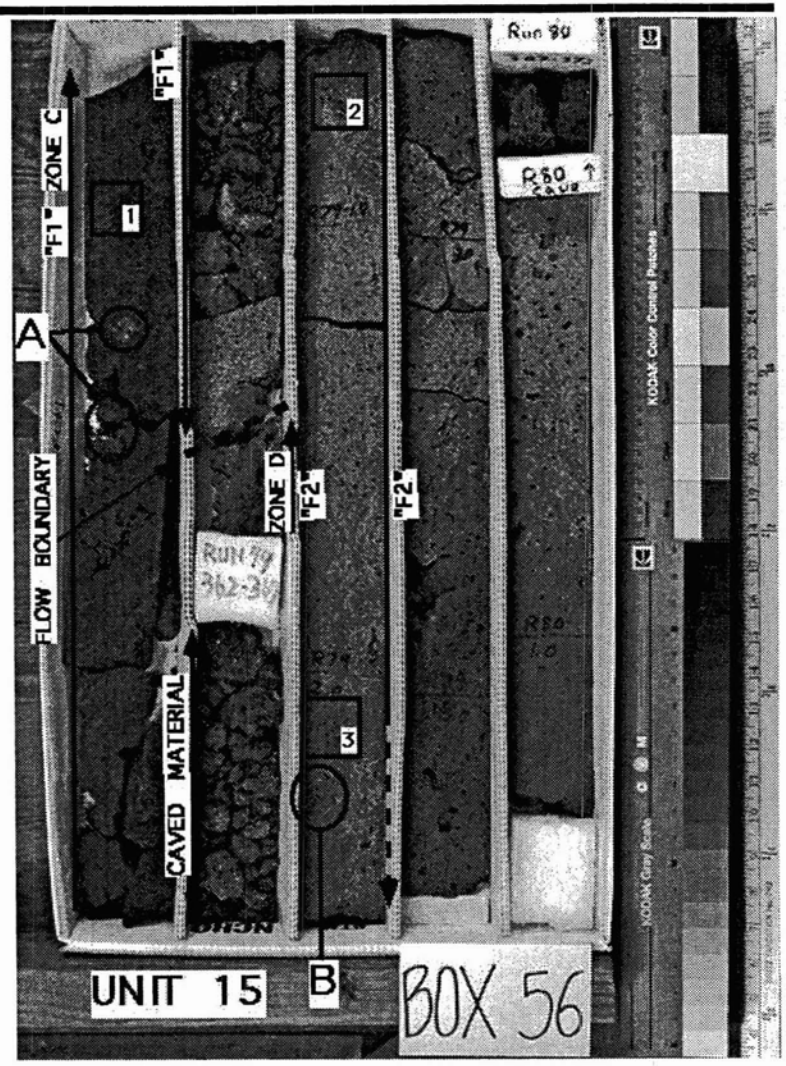
Vesicles: 5-10% – 1-5 mm – sub-rounded to sub-angular – horizontally elongated to equant –
Size variation: 1 to 40 mm.

Alteration: fresh (<2% altered) in massive zone; highly-oxidized (40-80% altered) in scoriaceous –

Veins: none

Fractures: weakly fractured: 3/9.4 ft

Additional comments:
There are 2 flows in this box. Flow 1 is highly oxidized and scoriaceous and continuous with Box 55, ending at Run 78+4.8' (Zone C on photo). Flow 2 consists of an uppermost 0.6' of oxidized material and is continuous to the end of the box. Feature "A" is a clinopyroxene?-olivine-plagioclase xenolith. Feature "B" is a fragment (4 cm long) of a highly vesicular olivine basalt incorporated into this flow.



Box #:	Cores in box
57	80 81 82

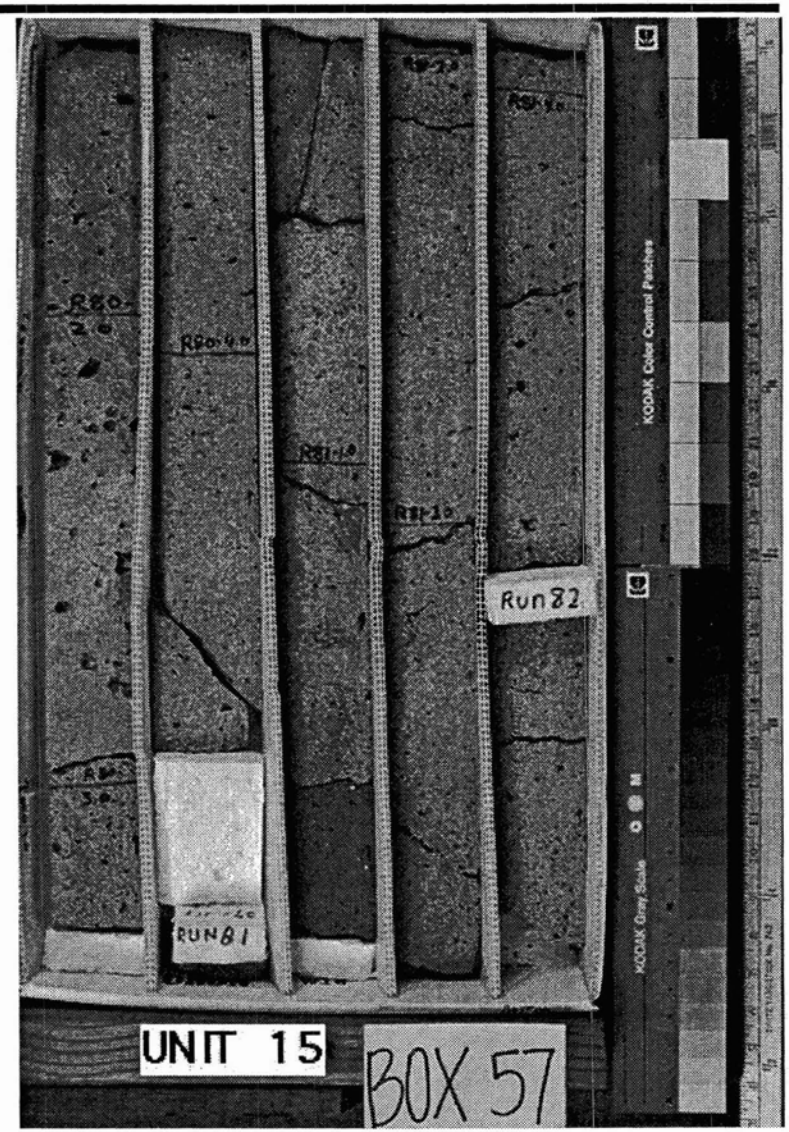
Loggers:	MG
Date logged:	11/4/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	368.4
Driller's depth:bottom [feet]:	377.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:15

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
Two point counts of 100 points each gave an average mode of 15% olivine phenocrysts.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: med. dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – spherical – –
irregular, some to 2 cm between R80+2.0 to 3.0'.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured, thin (<1 mm) zone of alteration along fracture
Additional comments:
NaCl ppt on dry core



Box #:	Cores in box
58	82 83

Loggers: MG
Date logged: 11/4/93
Checked by: MG
Check date: 11/4/93

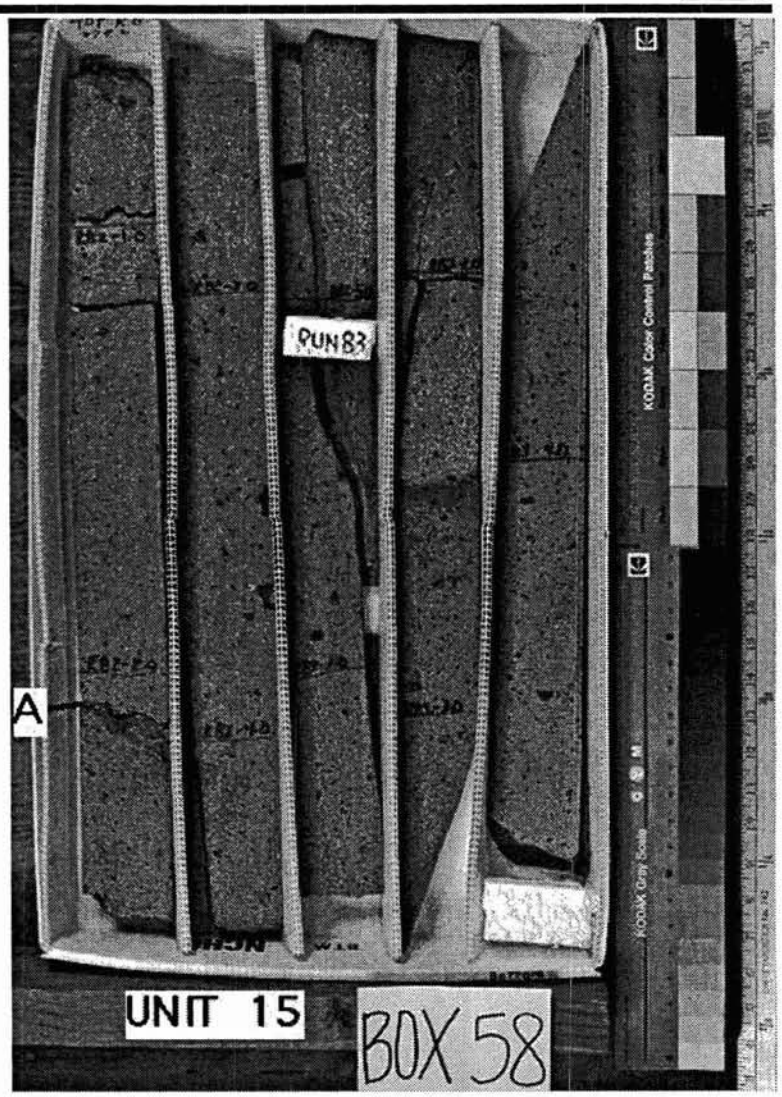
Driller's depth:top [feet]: 377.6
Driller's depth:bottom [feet]: 386.8
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:15

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
approx. 30% olivine, based on modes of 29 and 32/100
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: med. dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – spherical to irregular – –
two populations: one large (2-3 mm), one small (<1 mm)
Alteration: slightly (2-10% altered) – clay along fractures
Oxidation in small vesicles.
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt on dry core. A = large open vug with inward radiating plagioclase crystals.



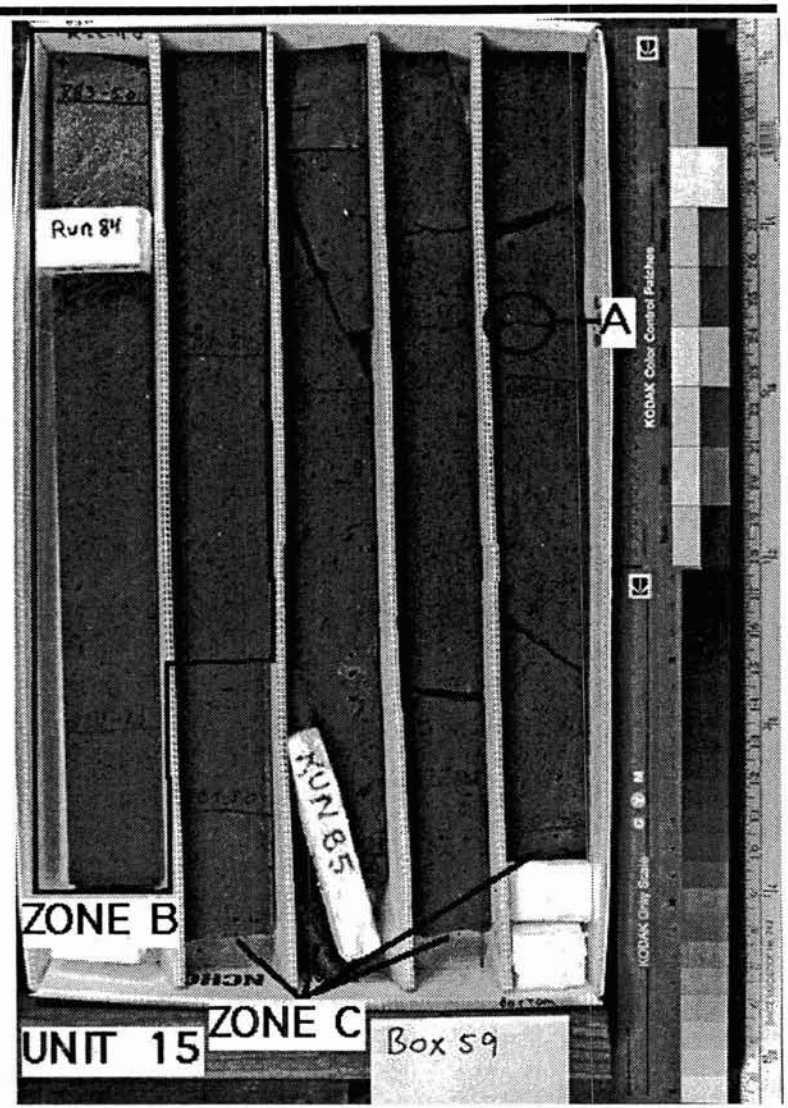
Box #:	Cores in box
59	83 84 85

Loggers:	BM
Date logged:	11/4/93
Checked by:	MG
Check date:	11/4/93

Driller's depth:top [feet]:	386.8
Driller's depth:bottom [feet]:	395.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:15**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky – Mn-oxide? fracture coating
Two point counts of 100 points gave modes of 14 and 17%.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: see below – – – –
Two sections annotated on photo: Zone "B" contains <1% vesicles; Zone "C" contains 5-10% vesicles, subrounded, horizontally elongate.
Alteration: slightly (2-10% altered) – Mn- and Fe-oxides
weathered and oxidized
Veins: none
Fractures: weakly fractured: 7/9 ft
Additional comments:
Feature "A" is an olivine-plagioclase xenolith. NaCl ppt on dried core surface.



Box #:	Cores in box
60	85 86 87

Loggers:	BM
Date logged:	11/4/93
Checked by:	MG
Check date:	11/5/93

Driller's depth:top [feet]:	395.6
Driller's depth:bottom [feet]:	404.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:15**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Internal flow contact at Run 86+0.4' (398'). Thin scoria (5 cm) and red oxidized zone (ca. 80 cm thick).
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky – Mn?-oxide fracture coating
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: – – – –
Base of upper flow (F1) is vesicle-poor <5%. Top of lower flow (F2) is 10-12% vesicles, subrounded, 2-4 mm diameter.
Alteration: oxidation over top 2.7' of F2 – Fe-oxides
Veins: none
Fractures: Weakly fractured: 16/9 ft. Yellow filamentous clay? (organic?) coating along non-oxidized fracture.
Additional comments:
This unit contains 2 flows with contact at 398'. NaCl ppt on dried core surfaces.

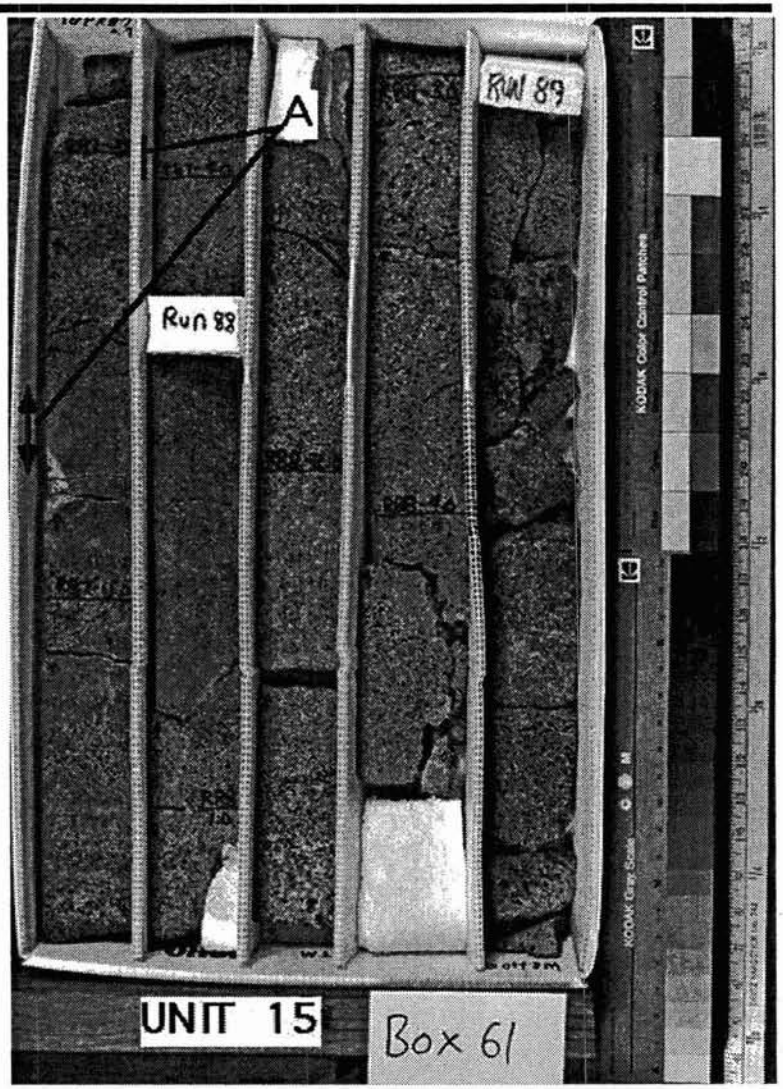
Box #:	Cores in box
61	87 88 89

Loggers:	MG
Date logged:	11/4/93
Checked by:	BM
Check date:	11/5/93

Driller's depth:top [feet]:	404.5
Driller's depth:bottom [feet]:	414.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:15**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – ~1, 2-3 mm – –
two populations; more abundant small, equant and less abundant large, blocky; counted 6 and 10/100
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: med. gray – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-5 mm – sub-rounded – horizontally elongated –
abundance variable; some zones 2-5 cm wide are weakly vesicular (~ 5%) marked on photo as A.
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly fractured: 15/8 ft; clay-like material concentrated along fractures and in vesicles in highly vesicular zones
Additional comments:
NaCl ppt; rare, small (3-6 mm) olivine-plagioclase-clinopyroxene and olivine-clinopyroxene inclusions (not open-textured).



Box #:	Cores in box
62	89 90 91

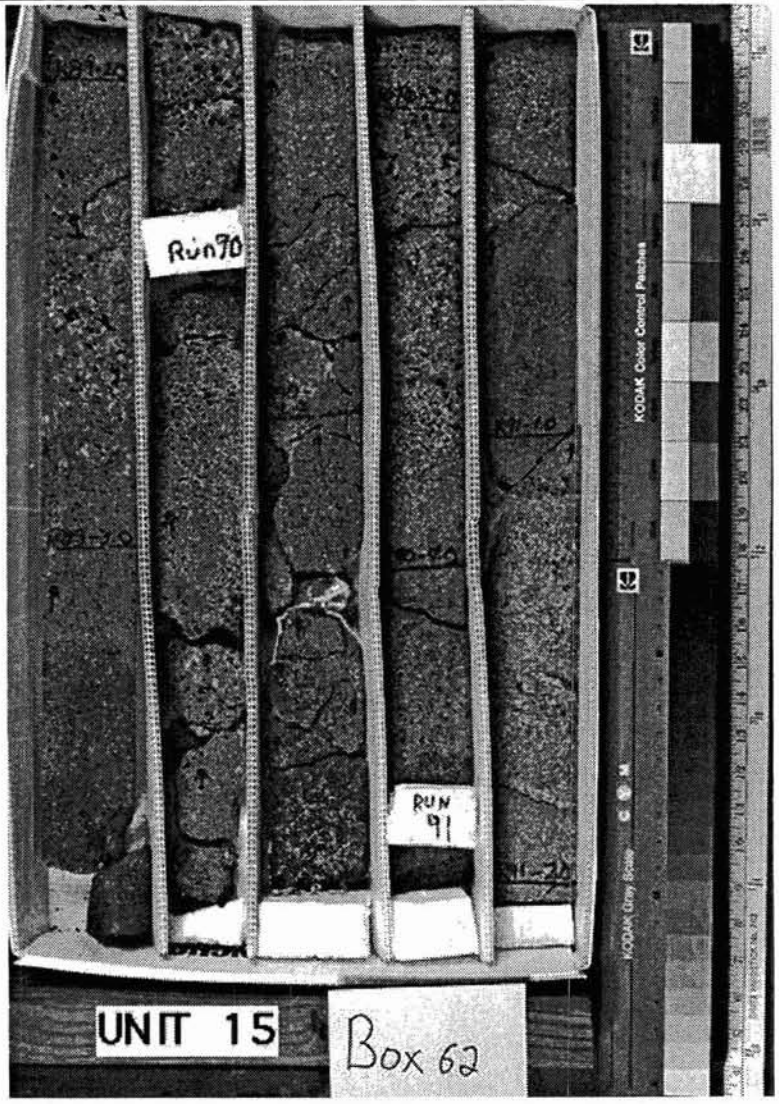
Loggers:	MG
Date logged:	11/5/93
Checked by:	BM
Check date:	11/5/93

Driller's depth:top [feet]:	414.7
Driller's depth:bottom [feet]:	423.9
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:15

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-12% – 1-5 mm – equant to blocky –
counted 10 and 12/100; two populations; small and large
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: med. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded – equant–
variable; >30% to 10-20%; some vesicles are interconnected and have a diameter of 20 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly to moderately fractured: 4/2 ft to 14/2 ft
Additional comments:
NaCl ppt on core surface



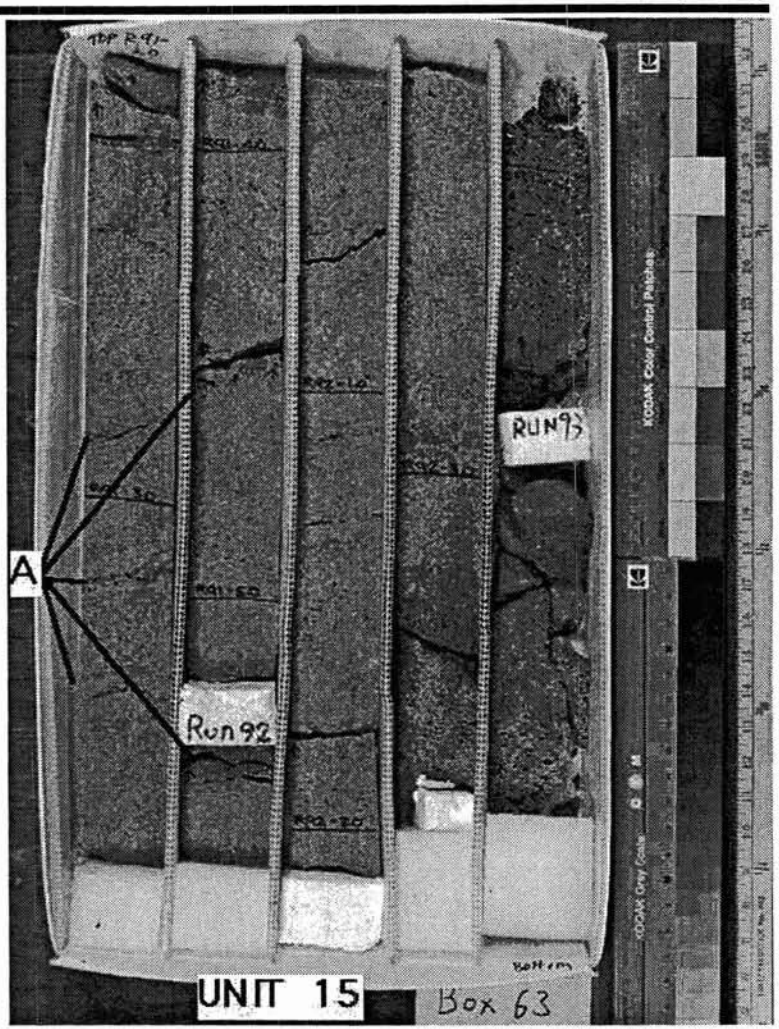
Box #:	Cores in box
63	91 92 93

Loggers:	MG
Date logged:	11/5/93
Checked by:	BM
Check date:	11/5/93

Driller's depth:top [feet]:	423.9
Driller's depth:bottom [feet]:	432.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:15**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-10% – 1-5 mm – equant to blocky –
two point counts: 6 and 8/100
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant –
variable; zones of highly (>30%) and moderately to weakly (5-10 %); more vesicular near bottom of box
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly in upper part; moderately at base of box
Additional comments:
A = bands of darker, horizontally elongate, large vesicles



Box #:	Cores in box
64	93 94

Loggers: MG
Date logged: 11/5/93
Checked by: BM
Check date: 11/5/93

Driller's depth:top [feet]: 432.7
Driller's depth:bottom [feet]: 442.0
Core type: HQ

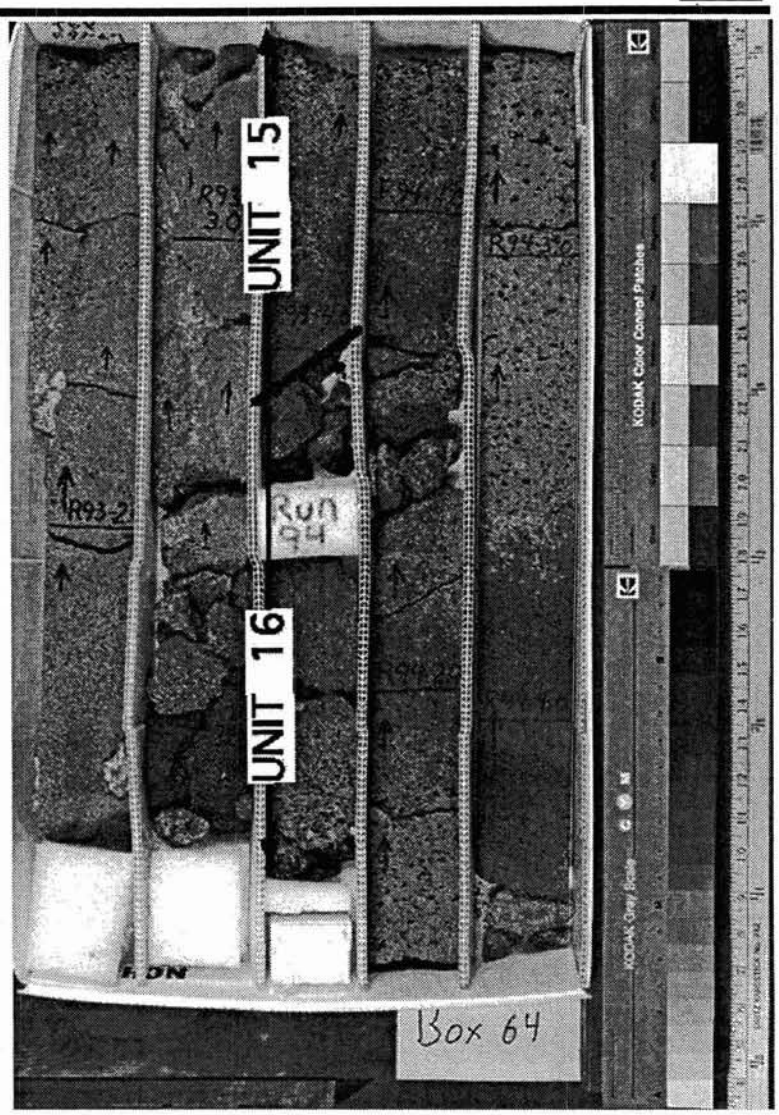
Units in box: 2

BOX UNIT 1: moderately olivine phyric basalt **UNIT #: 15**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R93-4.8-436.8')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant to blocky –
counted 7 and 9/100
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly down to 3 ft from base of box then moderately; clay-like material along some fractures
Additional comments:

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 16**

Contacts: Top (ft): (R 93-4.8-436.8')(flow)
Bottom (ft): (R--')(continuous with next box)
red oxidized zone at top
Unit type: pahoehoe
strongly vesicular top
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~30% – 1-5 mm – equant to acicular –
counted 30/100; elongate or acicular shapes present
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: med. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – spherical – equant –
highest at flow top; decreasing downward
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly; 4/3 ft starting 1 ft below flow top
Additional comments:



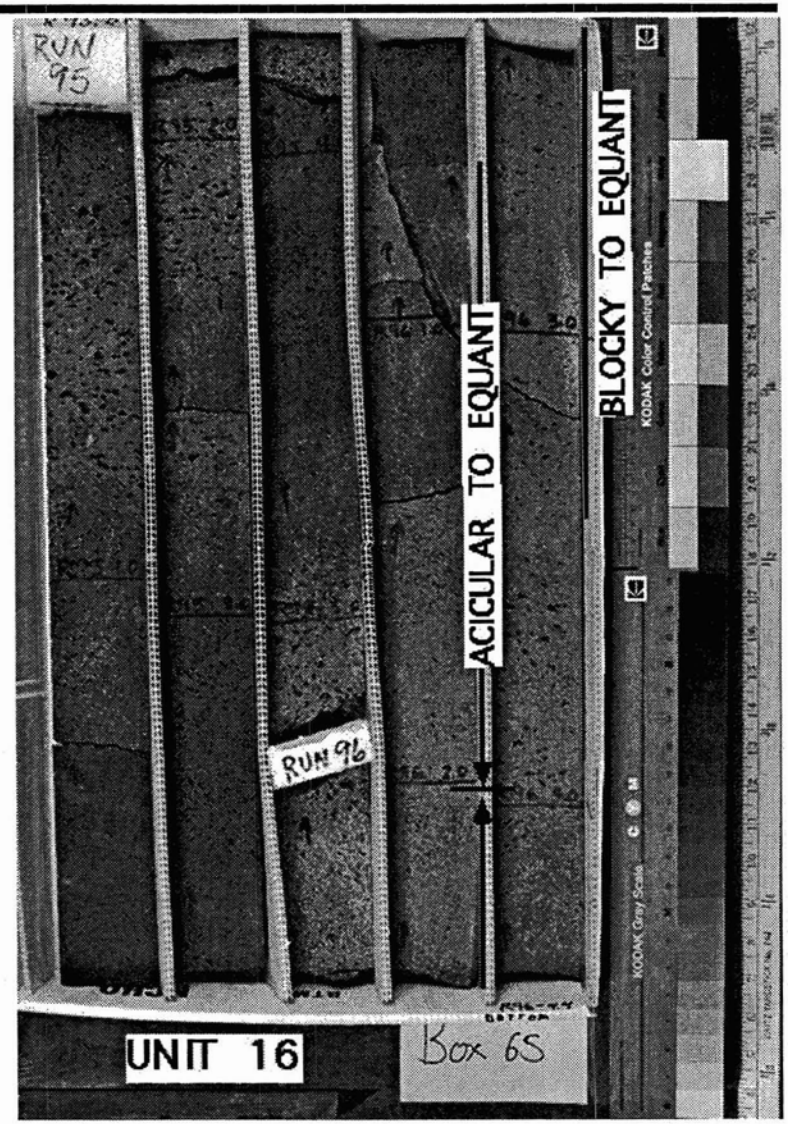
Box #:	Cores in box
65	95 96

Loggers:	BM
Date logged:	11/5/93
Checked by:	BM
Check date:	11/5/93

Driller's depth:top [feet]:	442.0
Driller's depth:bottom [feet]:	451.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:16**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe to massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – see below –
One point count of 100 points gave a mode of 18%; from 442-449' the shape of the olivine varies from acicular to equant, while from 449-451.5' (cumulate zone?) acicular crystals are no longer evident and the shape varies from equant to blocky; size variance of single grains <1 to 6 mm; olivine crystal clots occur in cumulate zone.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5Y 4/1 olive gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-angular – equant–
max. diameter=20 mm
Alteration: fresh (<2% altered) –
Veins:
Fractures: weakly: 4/9 ft
Additional comments:
There is a transition from acicular to equant olivine basalt to equant to blocky olivine basalt at ~449'. The latter portion of this box may be a cumulate zone.



Box #:	Cores in box
66	96 97 98

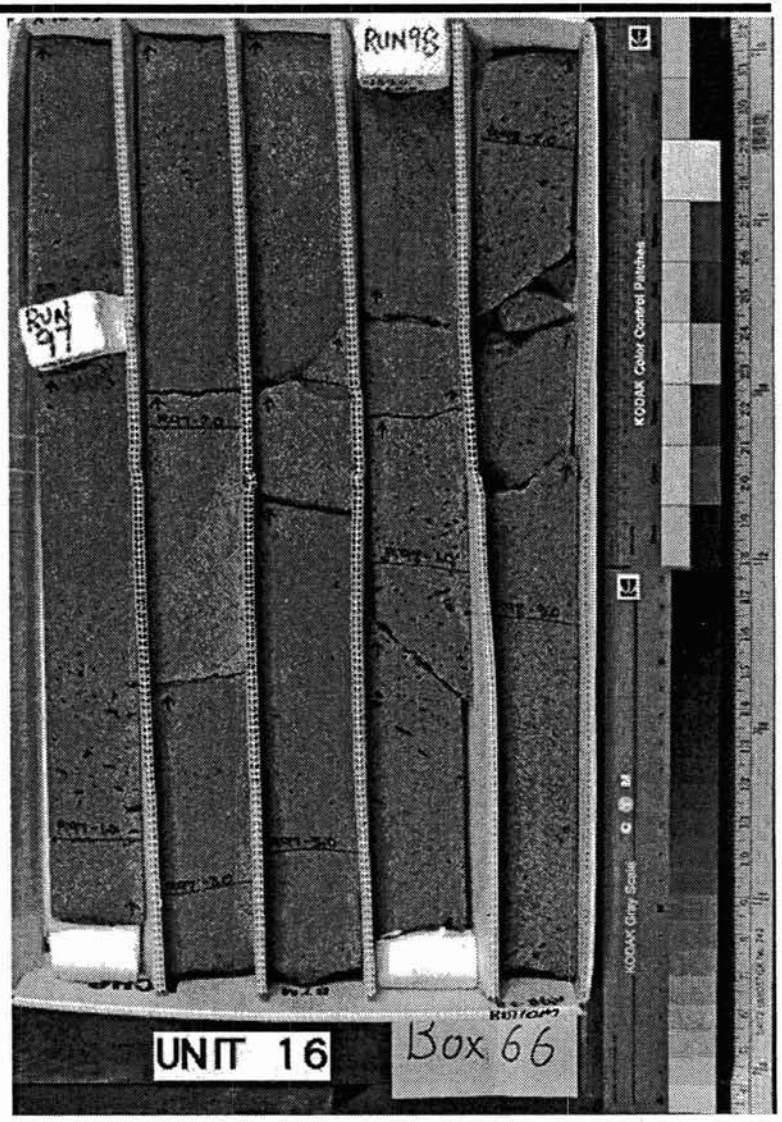
Loggers:	MG
Date logged:	11/5/93
Checked by:	BM
Check date:	11/5/93

Driller's depth:top [feet]:	451.5
Driller's depth:bottom [feet]:	461.4
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:16

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~30% – 1-5 mm – equant to blocky – acicular grains begin at R97-4.0'
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5Y 4/1 olive gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant–variable; < 5% to 10-15%
Alteration: fresh (<2% altered) –
Veins:
Fractures: weakly: 4/6 ft
Additional comments:



Box #:	Cores in box
67	98 99 100

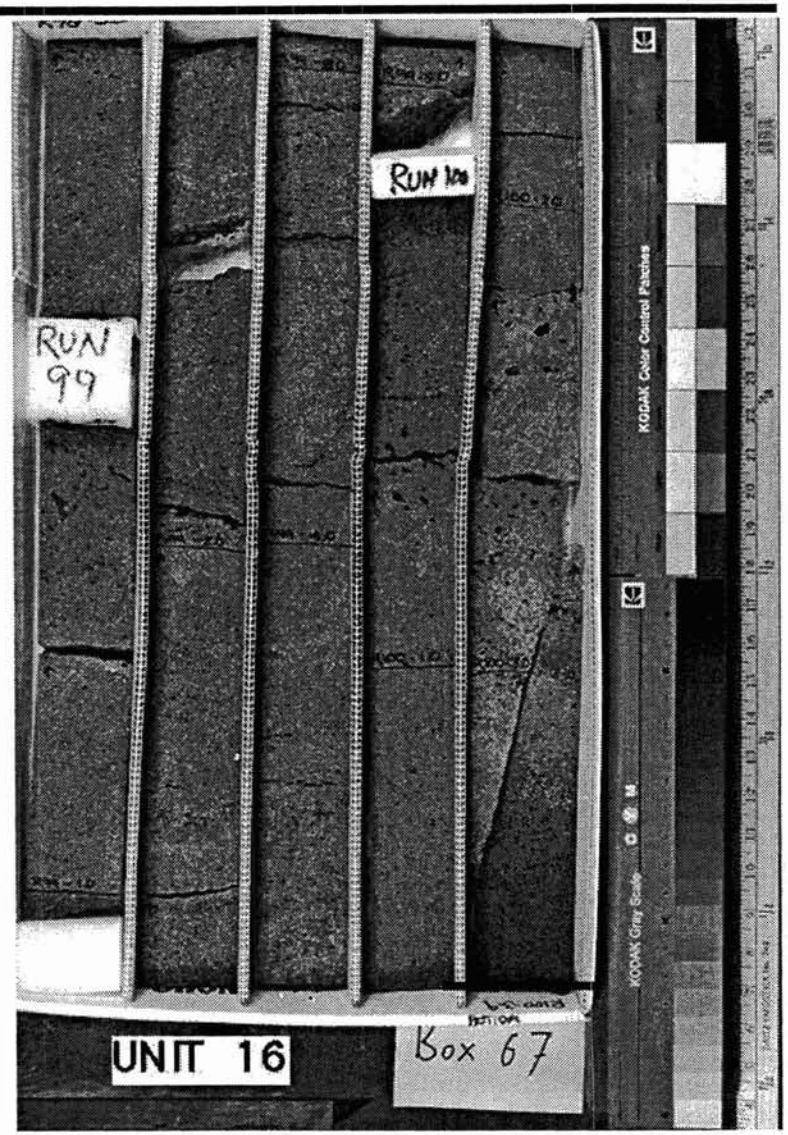
Loggers:	MG
Date logged:	11/5/93
Checked by:	BM
Check date:	11/5/93

Driller's depth:top [feet]:	461.4
Driller's depth:bottom [feet]:	470.9
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:16

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R100-3.9-471.0')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~ 30% – 1-5 mm – equant to blocky –
acicular elongate grains common
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – horizontally elongated –
acicular hematite at box top
dark zones 2-4 cm wide of large vesicles with vapor-phase mineral growth
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly:7/6 ft; red stain on 1 fracture
Additional comments:
platy to acicular, white mineral in vugs



Box #:	Cores in box
68	100 101 102

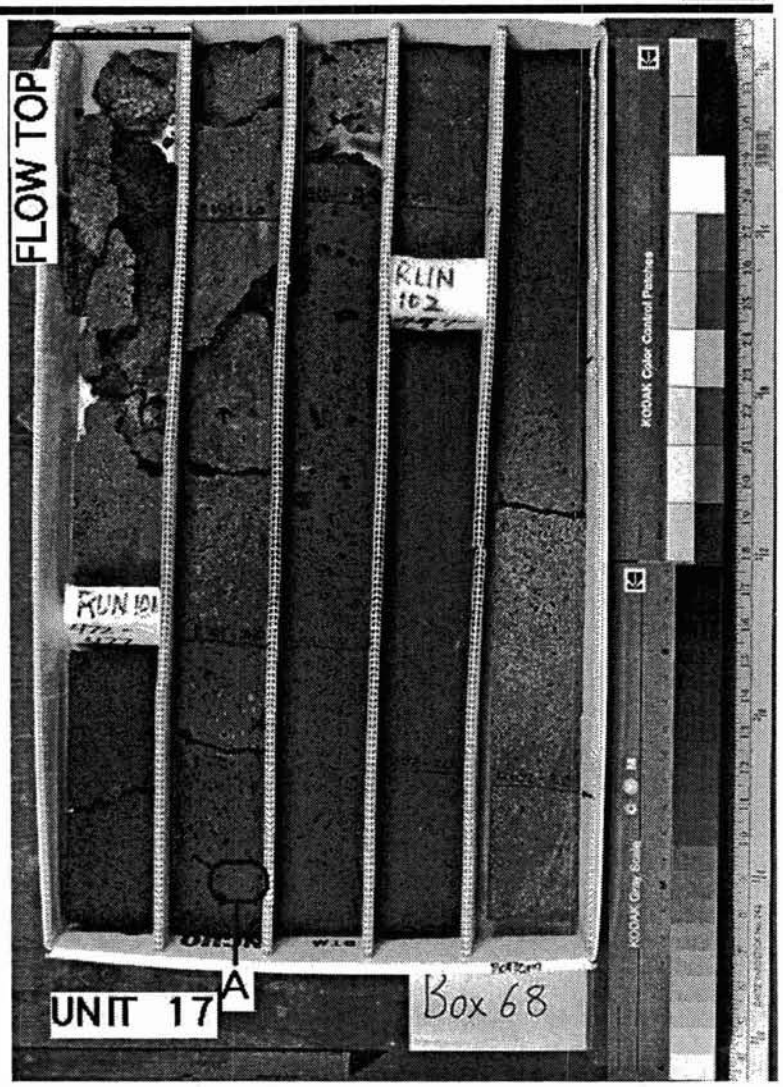
Loggers:	BM
Date logged:	11/5/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	470.9
Driller's depth:bottom [feet]:	480.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately to highly olivine phyric basalt

UNIT #:17

Contacts: Top (ft): (R 100-3.9-471.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
top of flow at top of box is highly scoriaceous and oxidized
Unit type: pahoehoe?
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-4 mm – equant to acicular –
Two point counts of 100 points gave 13 and 9%. Size range: 1-5 mm.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5Y 4/1 olive gray – **Structures:** – **Sorting:** –
Vesicles: 5-20% – 1-5 mm – sub-rounded to sub-angular – equant–
acicular hematite
Size and % decrease down section to R102-1.5 and then gradually increase.
Alteration: slightly (2-10% altered) –
Mn-oxides along fractures. Upper 2.5' of core is oxidized (with clay coating).
Veins:
Fractures: weakly: 4/10'
Additional comments:
Feature "A" is an olivine-plagioclase clot.



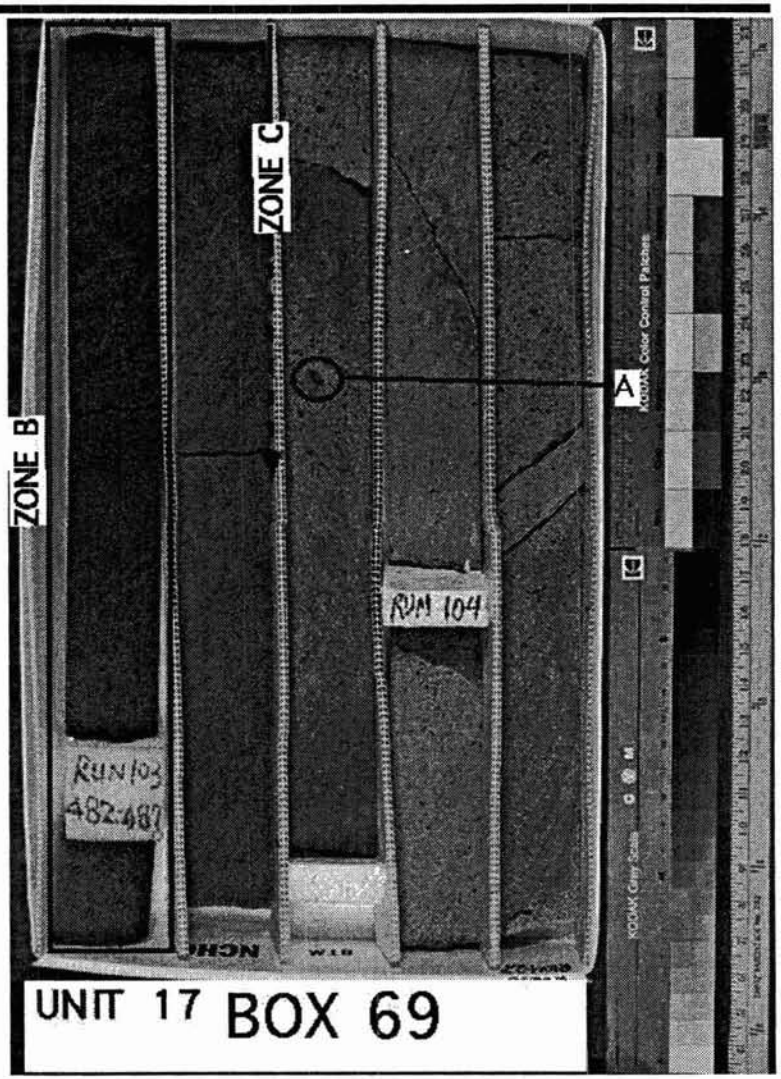
Box #:	Cores in box
69	102 103 104

Loggers:	BM
Date logged:	11/5/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	480.5
Driller's depth:bottom [feet]:	489.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:17**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – acicular to equant – Mn-oxide along fractures
One point count of 100 points gave a mode of 16%.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5Y 4/1 olive gray – **Structures:** – **Sorting:** –
Vesicles: see below – – – –
Two zones noted on photo. Zone "B:" from R102-3.4' to R103-0.4': 10-20%, subangular, randomly elongate; zone "C" from R103-0.4' to end of box: <5% vesicles.
Alteration: slightly (2-10% altered) –
Veins:
Fractures: weakly fractured: 5/9 ft
Additional comments:
Feature "A" is an olivine-clinopyroxene crystal clot.



Box #:	Cores in box
70	104 105 106

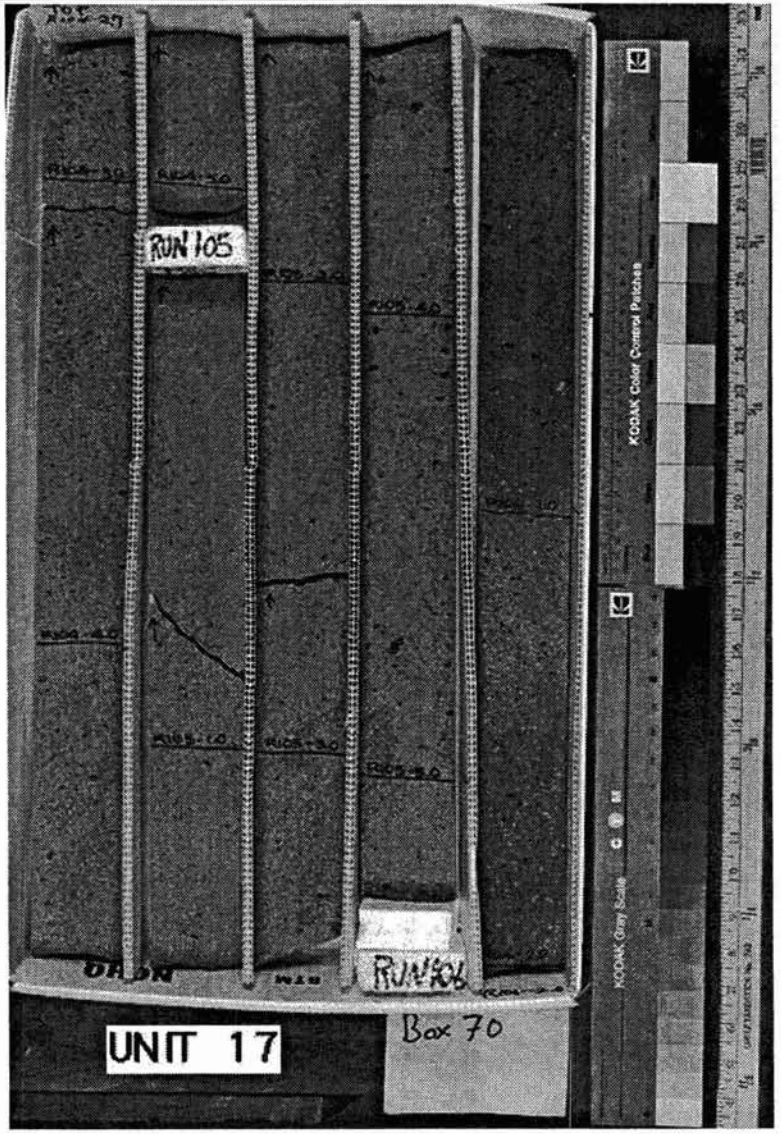
Loggers:	MG
Date logged:	11/5/93
Checked by:	BM
Check date:	11/7/93

Driller's depth:top [feet]:	489.6
Driller's depth:bottom [feet]:	499.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to tabular –
counted 23 olivine grains per 100 grid points
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: 5Y 4/1 olive gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – spherical – equant–
percentage of vesicles increases towards bottom of box
Alteration: fresh (<2% altered) –
Veins:
Fractures: very weakly: 3/10 ft
Additional comments:
olivine-clinopyroxene inclusions throughout

UNIT #:17



Box #:	Cores in box
71	106 107 108

Loggers:	MBB
Date logged:	11/17/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	499.6
Driller's depth:bottom [feet]:	508.9
Core type:	HQ
Units in box:	3

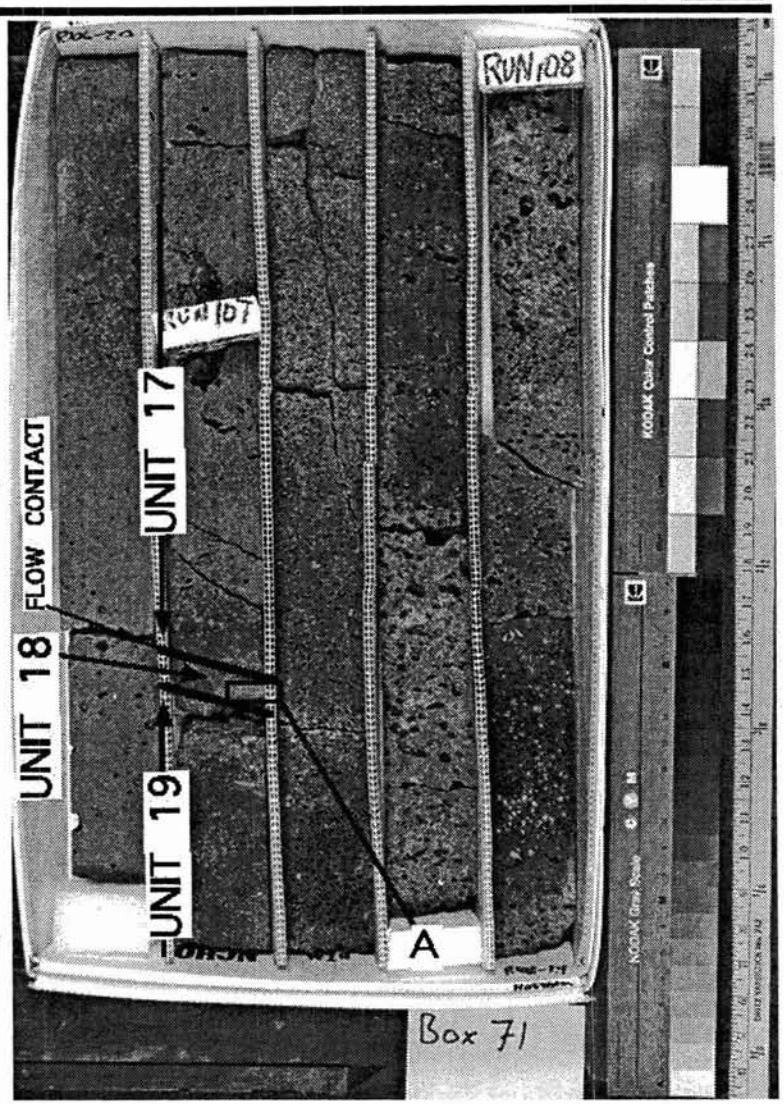
BOX UNIT 1: highly olivine phyric basalt **UNIT #: 17**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 107-0.7-502.7')(flow contact)
Contact defined by ~1 cm thick red (oxidized) ash(?) layer.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-5 mm – equant to blocky –
Point count: 16% at R106-3.6. Olivines contain spinel inclusions and are present in crystal clots.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 2-4 mm – rounded to subrounded – equant –
Rare vesicles > 5 mm. Vesicle size decreases and the vesicles become more angular toward flow bottom. Large pipe vesicle near base (R106-4.5). Counts of 5, 7/100.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 5/3.1 ft
Additional comments:

BOX UNIT 2: fine-grained highly weathered volcanic ash **UNIT #: 18**

Contacts: Top (ft): (R 107-0.7-502.7')(flow contact)
Bottom (ft): (R 107-0.7-502.7')(depositional)
Unit type: ash(?)
material appears to be highly weathered
Phenocrysts/Clasts:
–
– – – –
– – – –
– – – –
Groundmass/Matrix: silt/clay (<0.125 mm) –
Color: – **Structures:** unbedded – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: very highly (80-95% altered) – clay
Veins:
Fractures:
Additional comments:
Within this unit are thin (<0.5 mm) horizontal white laminations, see region circled "A" on photo. This unit infills the vesicles in the basalt unit below it.

BOX 71 CONTINUED ON NEXT PAGE



Box #:	Cores in box
71	106 107 108

Loggers:	MBB
Date logged:	11/17/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	499.6
Driller's depth:bottom [feet]:	508.9
Core type:	HQ
Units in box:	3

BOX UNIT 3: aphyric basalt

UNIT #: 19

Contacts: Top (ft): (R 107-0.7-502.7')(flow contact)
Bottom (ft): (R--')(continuous with next box)

Unit type: massive

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –

Color: N4 medium dark gray– **Structures:** – **Sorting:** –

Vesicles: see comments – – – –

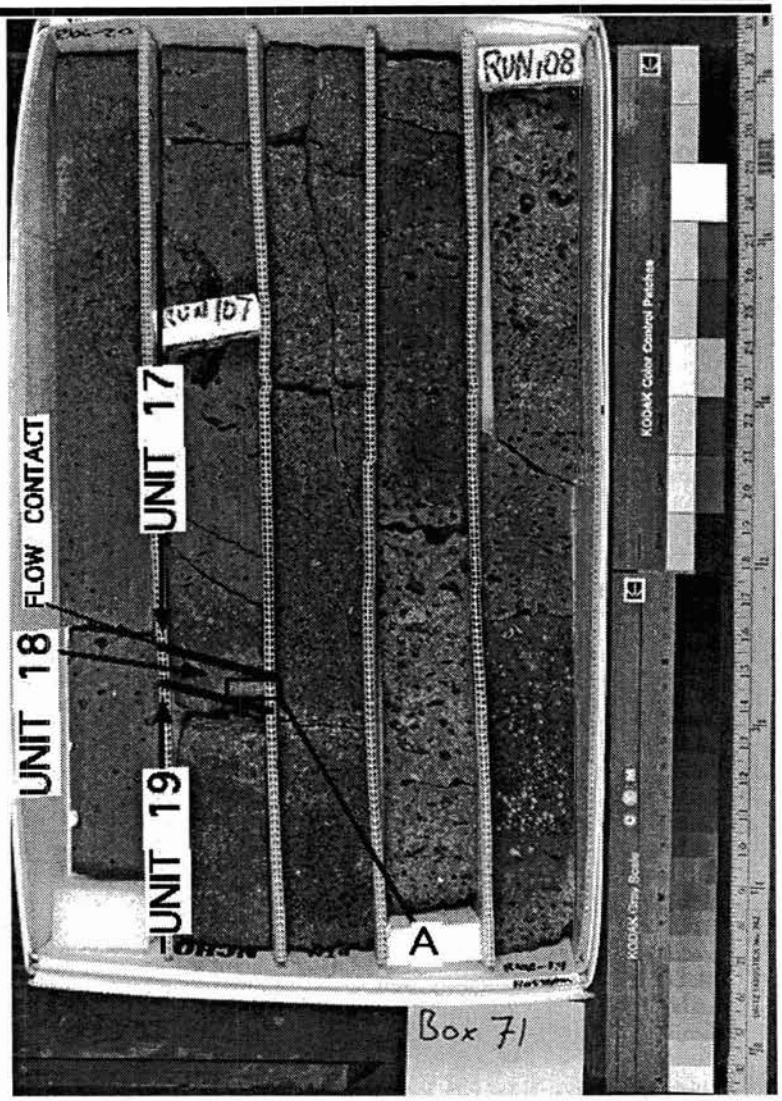
Just below contact, vesicles constitute 30-50% of the rock, are ≤1 mm in size and are subrounded to subangular with white-pink coatings on vesicle surfaces; some of the vesicles are filled with material from the ash(?) layer above. Below R107-4.0, vesicles constitute ~10-15% of the rock, are ~5 mm in size and are subrounded to subangular and are subhorizontally elongate.

Alteration: fresh (<2% altered) –

Veins: none

Fractures: weakly fractured: 10/6.2 ft

Additional comments:
NaCl ppt; groundmass has abundant small angular vesicles often bounded by plagioclase laths



Box #: 72

Cores in box
108
109

Loggers: JCL
Date logged: 11/7/93
Checked by: MG
Check date: 11/10/93

Driller's depth:top [feet]: 508.9
Driller's depth:bottom [feet]: 518.3
Core type: HQ

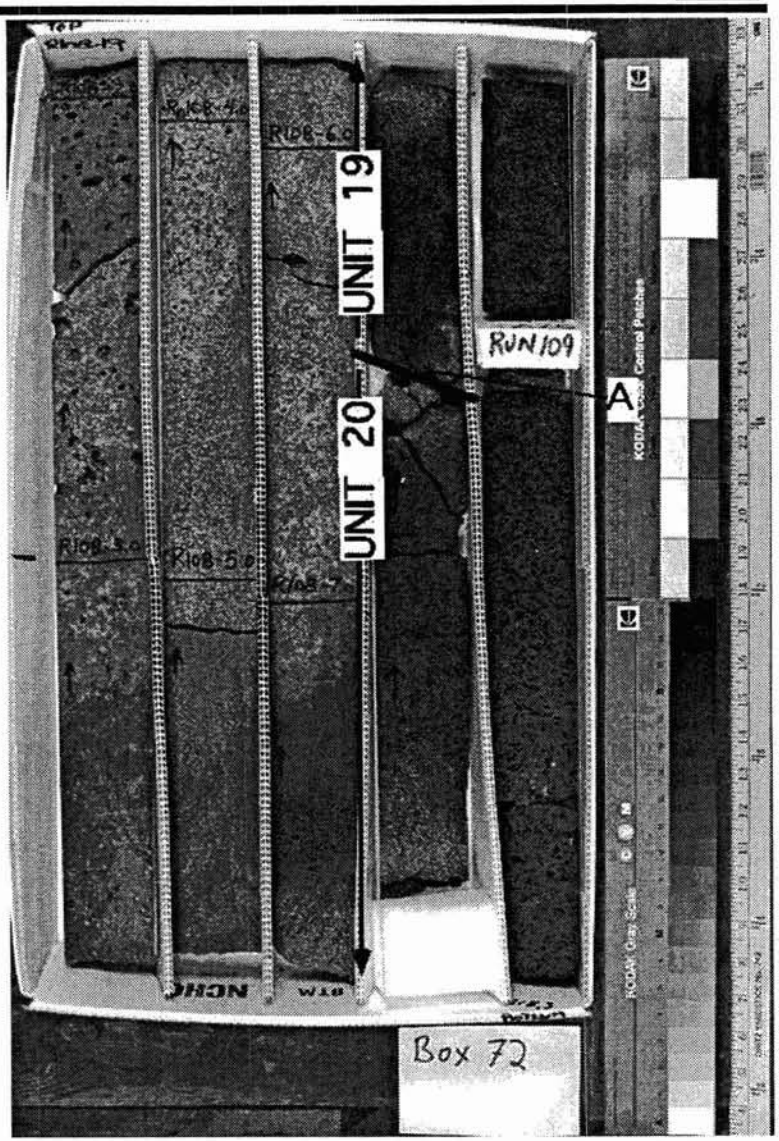
Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 19

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R108-8.5-515.7')(flow contact)
ropy pahoehoe surface on base of flow (R108-8.5) with red oxidized highly vesicular zone beneath, but no pronounced lithology change
Unit type: massive
pahoehoe type bottom surface
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) – fine grained tabular crystals in a microcrystalline matrix
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – <1 mm – rounded – equant –
Large (up to 10 mm) rounded vesicles present from R108-1.9 to 4.4. From 4.4-7.4, small vesicles described above. From 7.4 to base, highly vesicular (up to 40%) with sub-mm spherical vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured 0-40°, red-yellow coating of some fractures
Additional comments:
A=ropy bottom of unit 1; NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 20

Contacts: Top (ft): (R 108-8.5-515.7')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium gray to 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-5 mm – rounded – horizontally elongated –
37% point count at R109-0.6. Vesicles become larger with depth.
Alteration: fresh (<2% altered) –
red oxidation at flow top, decreasing with depth
Veins: none
Fractures: weakly fractured below vesicular oxidized zone at top of flow
Additional comments:



Box #:	Cores in box
73	109 110

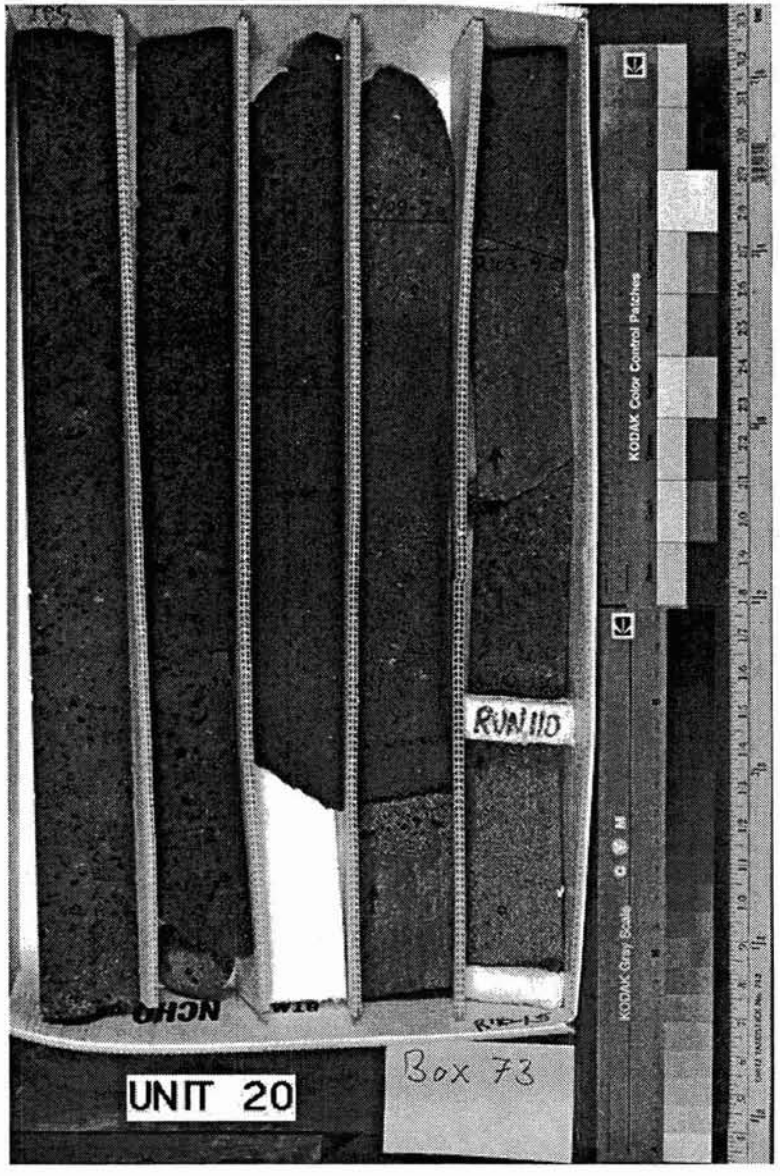
Loggers:	BM
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	518.3
Driller's depth:bottom [feet]:	527.8
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:20

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
This is an interior section of an approx. 20' thick aa flow.
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) – <1 mm long tabular elongate feldspar crystals dominate visible groundmass
Color: N4 med. dark gray – **Structures:** – **Sorting:** –
Vesicles: variable – – – –
rhombic/platy, white to dark red crystals
10-20% vesicles from R109+1.3' to R109+5.3' which are spherical, subrounded, 5-10 mm diameter, equant; from R109-5.3 to base there are <5% vesicles, 1- 5 mm diameter. Some horizontal, vesicle-rich zones are present.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 3/9.5 ft
Additional comments:
NaCl ppt



Box #:	Cores in box
74	110 111

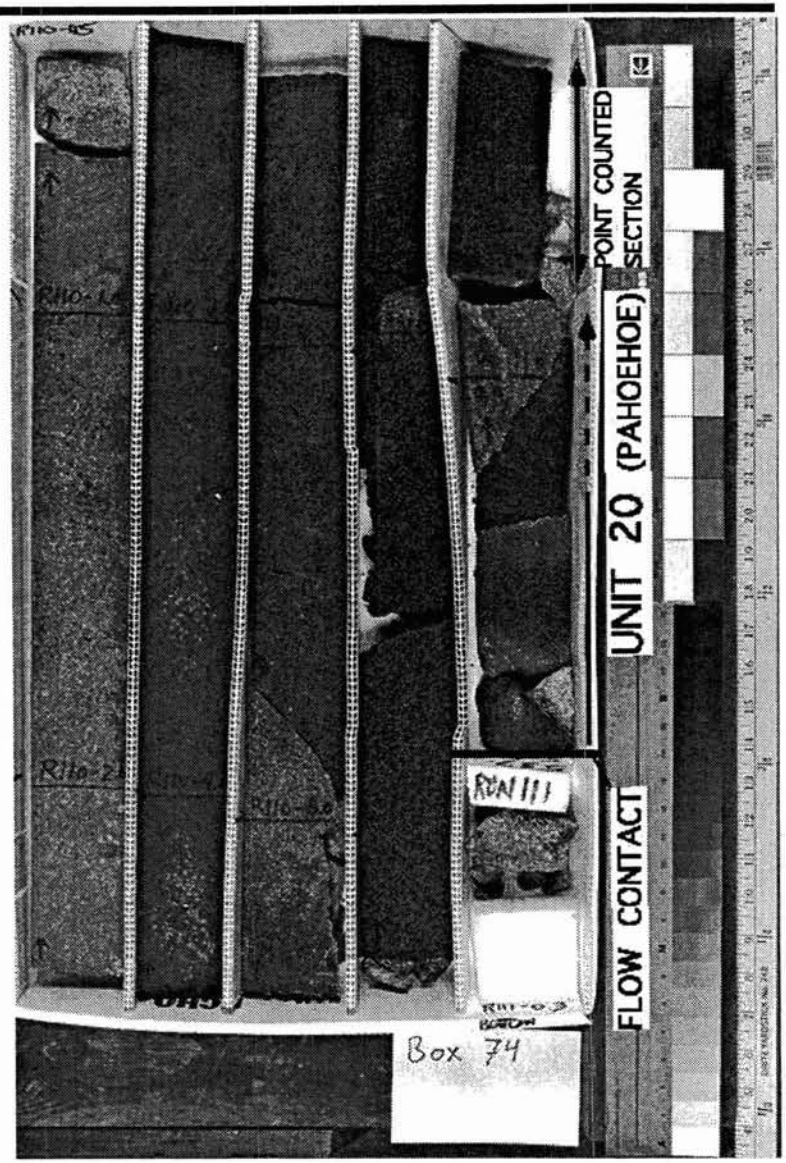
Loggers:	BM
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	527.8
Driller's depth:bottom [feet]:	536.8
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:20

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R110-9.7-536.9')(flow contact)
transitional from massive unit to pahoehoe flow bottom
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1 mm – spherical – equant –
One point count of 100 points gave a mode for vesicles of 30%.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 8/9 ft
Additional comments:
NaCl ppt



Box #:	Cores in box
75	111

Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	536.8
Driller's depth:bottom [feet]:	545.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:21**

Contacts: Top (ft): (R 110-9.7-536.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Pahoehoe surface textures and ~1 cm thick reddish oxidized zone define contact. Unit appears to be very similar to unit directly above it (R110-9.0 to bottom of box).

Unit type: massive

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: – **Structures:** – **Sorting:** –

Vesicles: 20-30% – 1-2 mm – sub-rounded – equant to elongate –
Vesicles are homogeneously distributed throughout section in Box 75; they are also uniform in size. In more fractured/rubbly zones, the vesicles have an ivory colored coating.

Alteration: fresh (<2% altered) –

Veins: none

Fractures: Fracturing varies from weakly to highly (i.e., the rubbly zones).

Additional comments:
See photo: "A" = zone of ropy surface textures and ~1 cm oxidation front. "B" = ropy surface textures (internal flow contact). "C" = rubbly zone with pieces that display a more "glassy", i.e., cryptocrystalline surfaces. Groundmass has abundant small angular vesicles often bounded by plagioclase laths.

Box #: 76

Cores in box
111
112
113

Loggers: JCL
Date logged: 11/7/93
Checked by: MG
Check date: 11/10/93

Driller's depth:top [feet]: 545.7
Driller's depth:bottom [feet]: 565.6
Core type: HQ

Units in box: 3

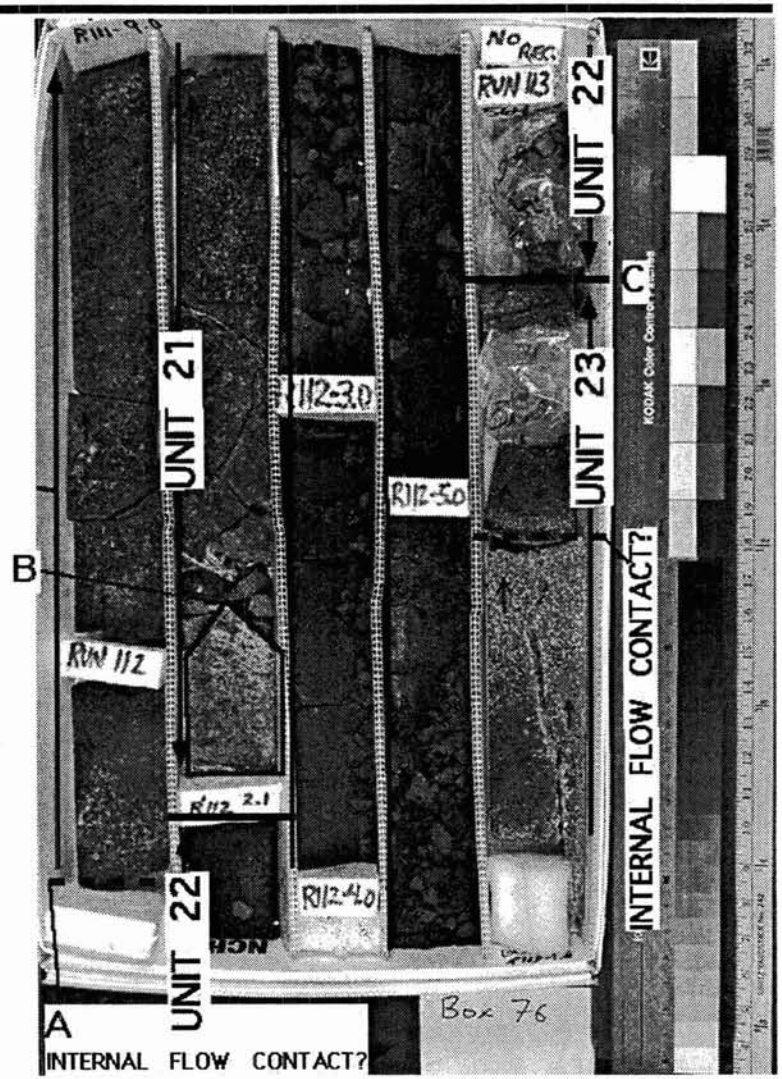
BOX UNIT 1: aphyric basalt — UNIT #: 21

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R112-2.1-549.6')(flow contact)
Unit type:
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: >30% – <1 mm – rounded – equant–
30-40%, 1 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly to moderately fractured, increasing towards contact
Additional comments:
A=probable internal flow contact. B=zone from R112-1.7 to 2.1 with basalt fragments, glass, and black sand intermixed in a red oxidized groundmass.

BOX UNIT 2: black sand-volcaniclastic sediment — UNIT #: 22

Contacts: Top (ft): (R 112-2.1-549.6')(flow contact)
Bottom (ft): (R113-0.3-564.3')(depositional)
bottom of unit at R113-0.3 to 0.55; small (0.2') piece of highly altered basalt with sand above and beneath, then basalt again
Unit type: volcaniclastic sand
Phenocrysts/Clasts:
–
basalt – – – –
olivine – <10% – – –
– – – –
Groundmass/Matrix: rounded fine- to medium-grained – iddingsitized olivines, black and red lithic fragments, some magnetic-susceptible material (magnetite?)
Color: N2 grayish black– **Structures:** unbedded – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures:
Additional comments:

BOX 76 CONTINUED ON NEXT PAGE



Box #:	Cores in box
76	111 112 113

Loggers:	JCL
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	545.7
Driller's depth:bottom [feet]:	565.6
Core type:	HQ
Units in box:	3

BOX UNIT 3: aphyric basalt

UNIT #: 23

Contacts: Top (ft): (R 113-0.3-564.3')(depositional)
Bottom (ft): (R--')(continuous with next box)
top of unit at R113-0.3 to 0.5

Unit type: massive

Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium gray– **Structures:** – **Sorting:** –

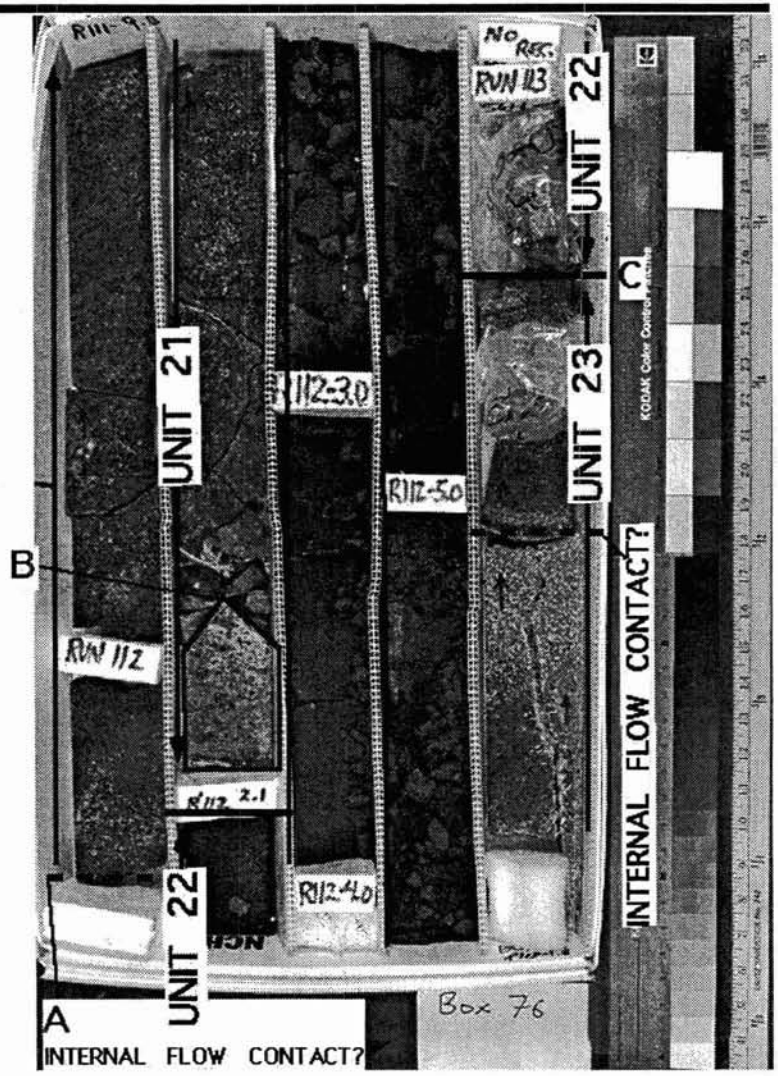
Vesicles: 20-30% – 1-5 mm – sub-rounded – irregular to equant to elongate–
soft white material partially infilling some vesicles, especially near upper contact.

Alteration: fresh (<2% altered) –

Veins: none

Fractures: weak to moderate, soft white-yellow coating

Additional comments:
Probable internal flow contact at R113-1.0 (glassy contact); (brown horizontal band with >50% sub-mm vesicles). Alteration becomes progressively greater towards upper contact.



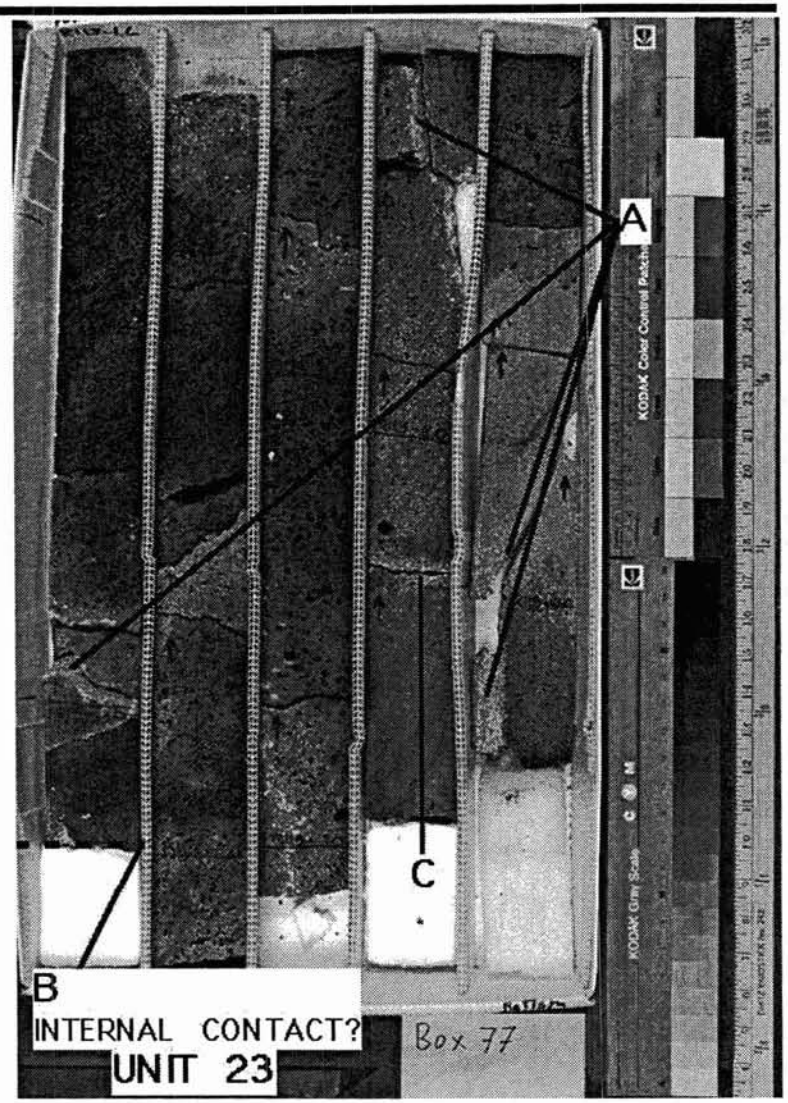
Box #:	Cores in box
77	113

Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	565.6
Driller's depth:bottom [feet]:	574.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:23**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: see comments – – – –
Percentage of vesicles varies from 10-20% to <5%; vesicle size lies in the range 1-5 mm. Vesicles are rounded to subrounded, equant to elongate (random orientation). At R113-7.0, vesicles are filled with a white/yellow clay(?) material.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 17/8.4 ft
Additional comments:
See photo: "A" = regions of filamentous coatings (biological?) on fractures. "B" = zone of ropy surface textures, probably an internal flow contact (glassy surface). "C" = internal quench zone. Groundmass has abundant small angular vesicles often bounded by plagioclase laths.



Box #:	Cores in box
78	114

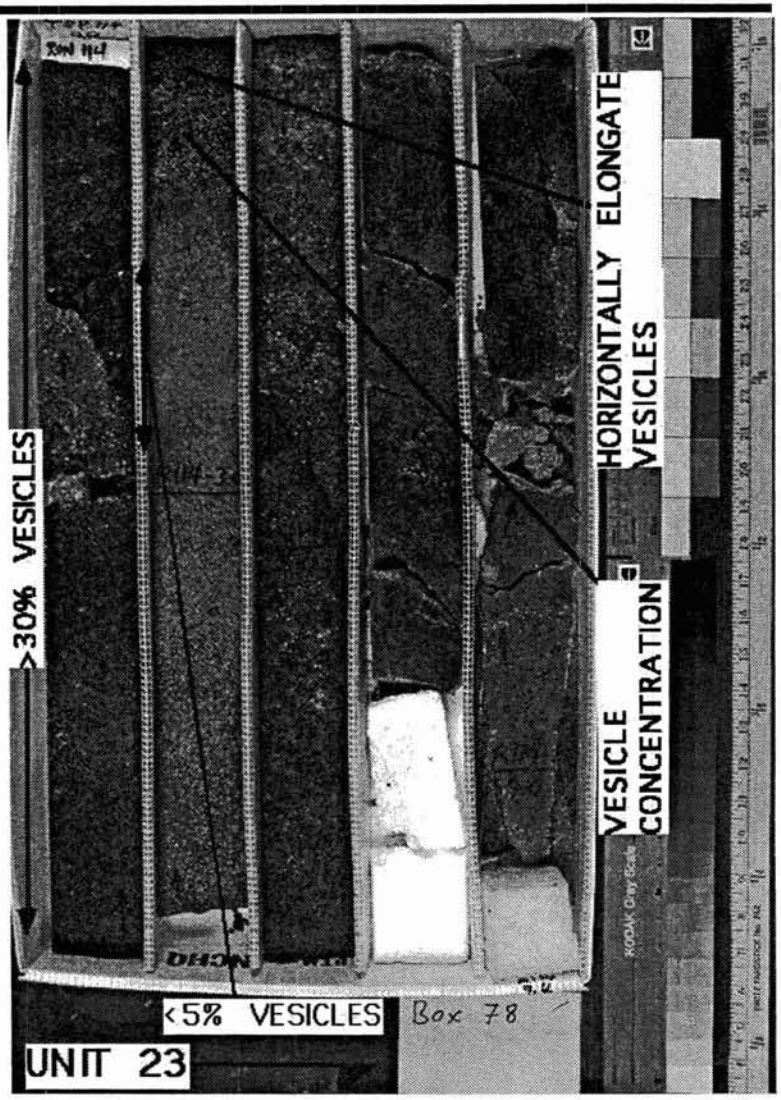
Loggers:	BM
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	574.0
Driller's depth:bottom [feet]:	583.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:23

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline – feldspars are tabular elongate
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: see below – 1-5 mm – spherical to sub-angular – equant to horizontal elongate – vesicle abundance varies from <5 to >30% (see photo)
Alteration: fresh (<2% altered) –
Veins:
Fractures: weakly fractured: 12/9 ft
Additional comments:
NaCl ppt



Box #:	Cores in box
79	114 115

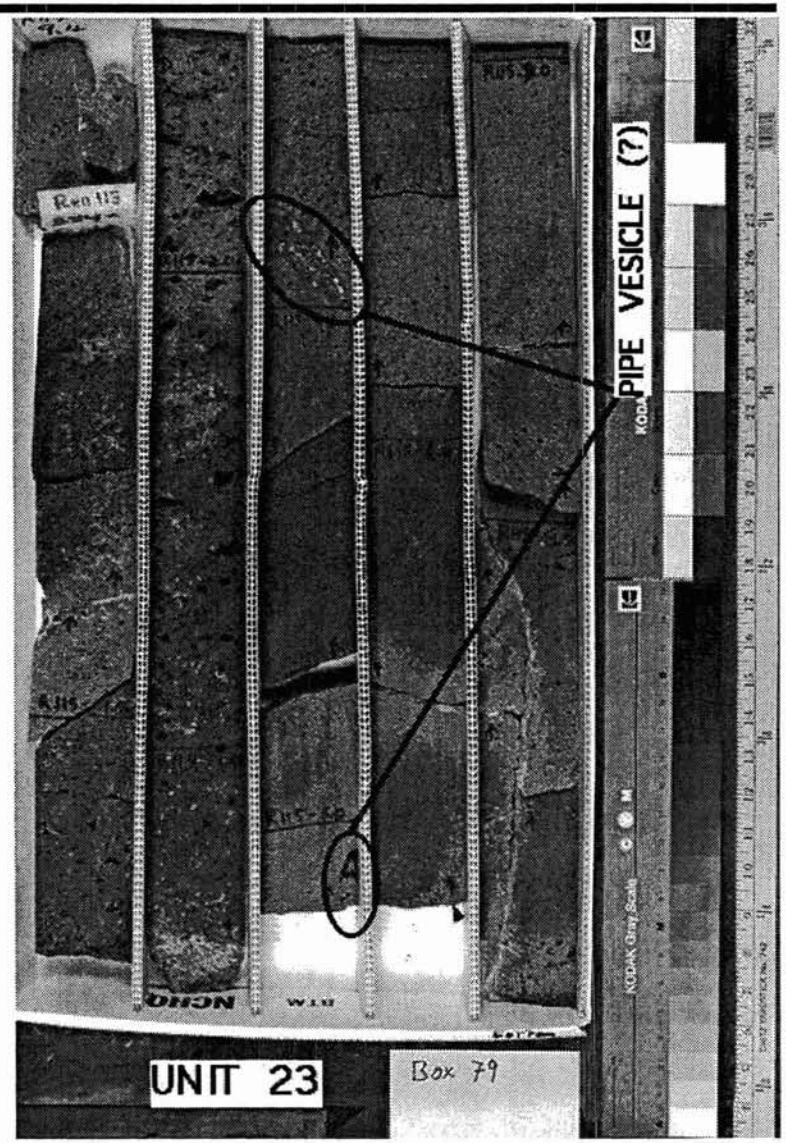
Loggers:	BM
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	583.6
Driller's depth:bottom [feet]:	593.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:23

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline – feldspars are tabular elongate
Color: N3 to N4, med. to dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% to 20-30% – <1 mm – sub-rounded to sub-angular – –
Max. size: 30 mm. Possible pipe vesicles (see photo), infilled with very fine grained basalt with a distinct population of vesicles.
Alteration: fresh (<2% altered) –
Veins:
Fractures: 9/10 ft. Some fractures lined with white to buff colored clay-like material.
Additional comments:
NaCl ppt



Box #:	Cores in box
80	115 116

Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	593.0
Driller's depth:bottom [feet]:	602.4
Core type:	HQ
Units in box:	5

BOX UNIT 1: aphyric basalt

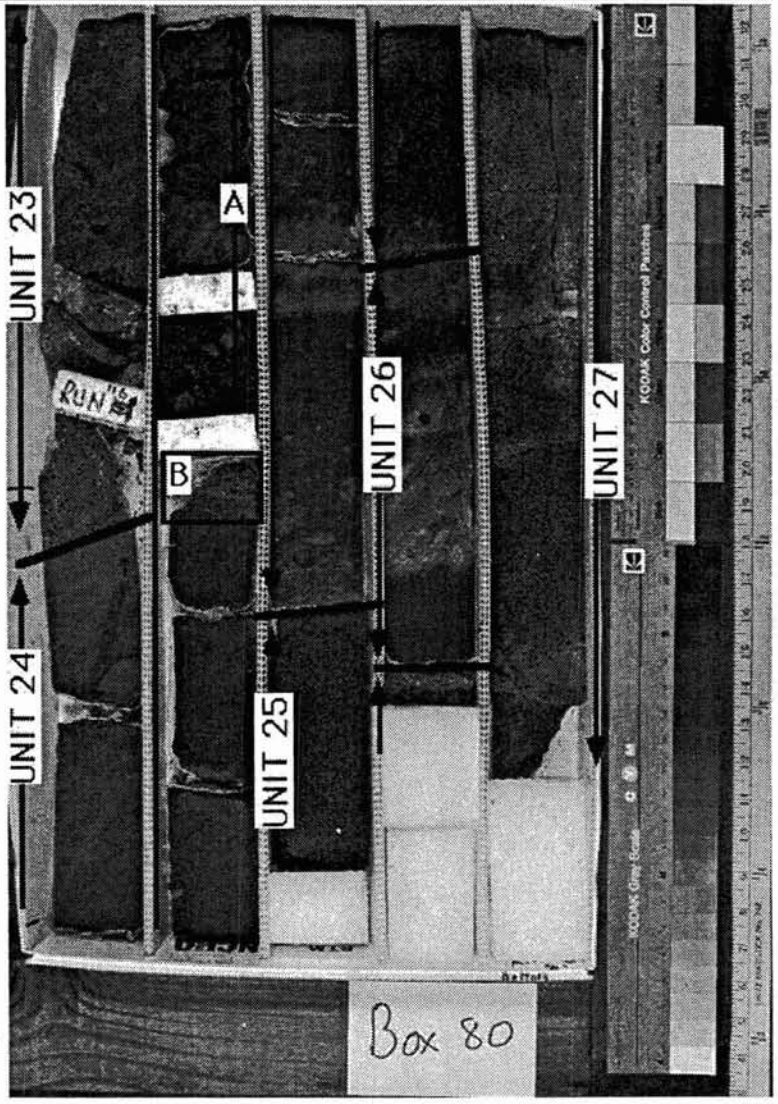
UNIT #: 23

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R116-0.3-594.3')(flow contact)
A thin (~1 mm) quench zone exists at the contact with ash (?) layer.
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-3 mm – rounded to subrounded – –
Rare large (>20 mm) subrounded and elongate vesicles. Angular <1 mm vesicles present in groundmass.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:

BOX UNIT 2: weathered volcanic ash/soil

UNIT #: 24

Contacts: Top (ft): (R 116-0.3-594.3')(flow contact)
Bottom (ft): (R116-4.1-598.1')(depositional)
Unit type: ash
Phenocrysts/Clasts:
<10% volcanic fragments –
volcanic clasts – 2-10% – 1-10 mm – sub-angular – clay
distribution is quite variable
– – – –
– – – –
Groundmass/Matrix: silt/clay (<0.125 mm) –
Color: – **Structures:** – **Sorting:** varies from well sorted to poorly sorted –
Vesicles: – – – –
Alteration: very highly (80-95% altered) – clay
Veins: none
Fractures: none
Additional comments:
See photo: "A" = zone of angular lithic (≥1 mm); some altered and partially altered olivines. "B" = zone of flattened highly altered pumice(?) fragments. Different colored angular clasts of fine-grained material are interspersed within this unit. Chocolate-brown, organic smelling clay unit.
JPL Comments, 11-23-93: This box contains core which samples approx. 5.1' of "Pahala Ash". In R116-0.9 to -1.8 classic base surge lithic debris is cored. This is composed of fines and depleted angular/sub-angular lithic clasts to 9 mm size. This surge material was almost certainly derived from a huge explosive phreatic eruption at Kilauea – nearly 40 km away (chemistry of lithic clasts should prove distinctive). This unit possibly correlates with an anomalous deposit of base surge deposits ~20 km to the SSE at Wung (sp?) Quarry. The age of this deposit was known to be only ">10 ka" in age. The 2.4' directly underlying the surge deposit is composed of organic rich "Pahala Ash" that has been highly disturbed. It looks as if it may have been deposited in a stagnant bog. A 14C AMS date will very likely be possible from this horizon – which will give a maximum age for the surge deposits and will fix a time horizon at this critical zone at ~595' depth.
GPLW comment: top foot of unit looks like hydrovolcanic palagonite tuff; next foot ("A"+"B" above) described as "lithic-rich pyroclastic (littoral cone?)", "the bed with the angular lithics is reminiscent of such beds in the Puu Ki littoral cone on the SW coast of Mauna Loa"
D. Clague comment, 11/20/93: Pahala ash, 10,000-30,000 years old



BOX 80 CONTINUED ON NEXT PAGE

Box #: 80

Cores in box
115
116

Loggers: MBB
Date logged: 11/7/93
Checked by: MG
Check date: 11/10/93

Driller's depth:top [feet]: 593.0
Driller's depth:bottom [feet]: 602.4
Core type: HQ

Units in box: 5

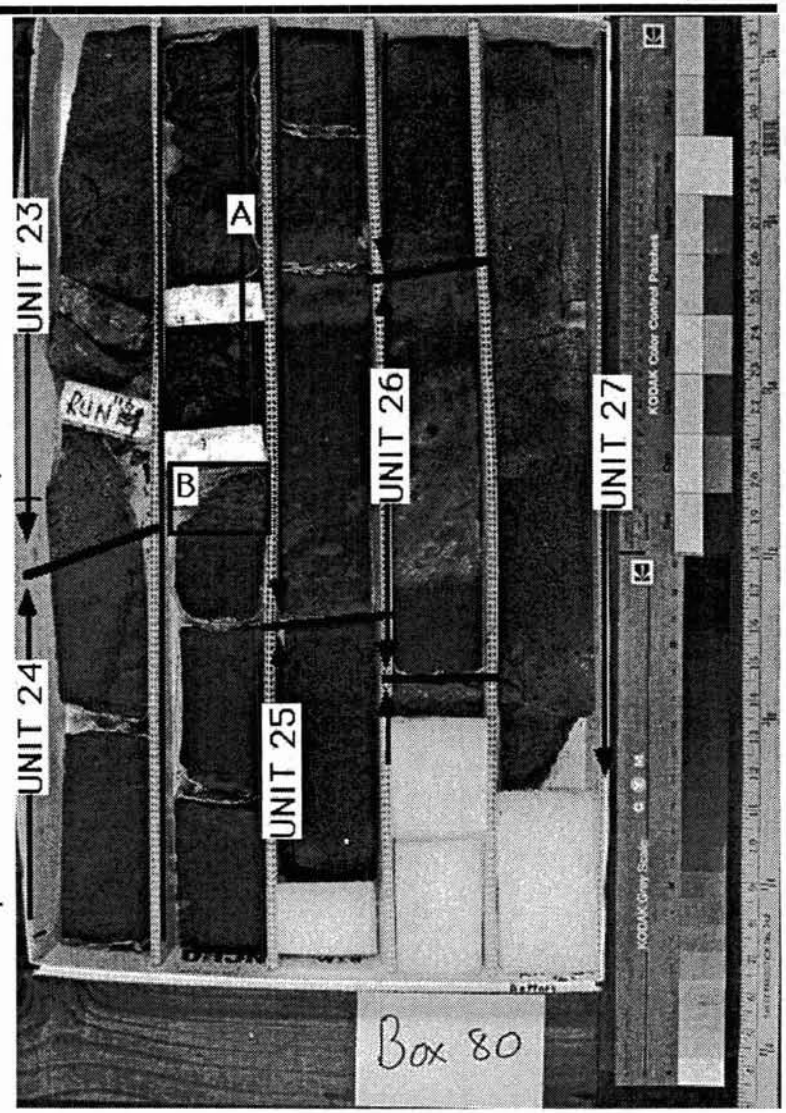
BOX UNIT 3: aphyric basalt — UNIT #: 25

Contacts: Top (ft): (R 116-4.1-598.1')(depositional)
Bottom (ft): (R116-5.1-599.1')(flow contact)
Thin (<5 mm) quench zones are present at top and bottom contact. Material at the bottom contact looks cryptocrystalline.
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – rounded – equant to elongate–
none
Alteration: fresh (<2% altered) –
Veins: none
Fractures: see description to unit 1
Additional comments:
This flow seems out of place within soil/ash unit.
GPLW comment: P-type pahoehoe

BOX UNIT 4: highly weathered volcanic ash/soil — UNIT #: 26

Contacts: Top (ft): (R 116-5.1-599.1')(flow contact)
Bottom (ft): (R116-6.0-600.0')(depositional)
Unit type:
Phenocrysts/Clasts:
–
– – – –
– – – –
– – – –
Groundmass/Matrix: –
Color: – **Structures:** – **Sorting:** –
Vesicles: – – – –
Alteration: –
Veins:
Fractures:
Additional comments:
see unit 2 for a description
GPLW comment: "hyaloclastite"

BOX 80 CONTINUED ON NEXT PAGE



Box #:	Cores in box
80	115 116

Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

Driller's depth:top [feet]:	593.0
Driller's depth:bottom [feet]:	602.4
Core type:	HQ
Units in box:	5

BOX UNIT 5: aphyric basalt

UNIT #: 27

Contacts: Top (ft): (R 116-6.0-600.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Faint glassy top

Unit type: pahoehoe
strongly vesicular top

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 dark gray– **Structures:** – **Sorting:** –

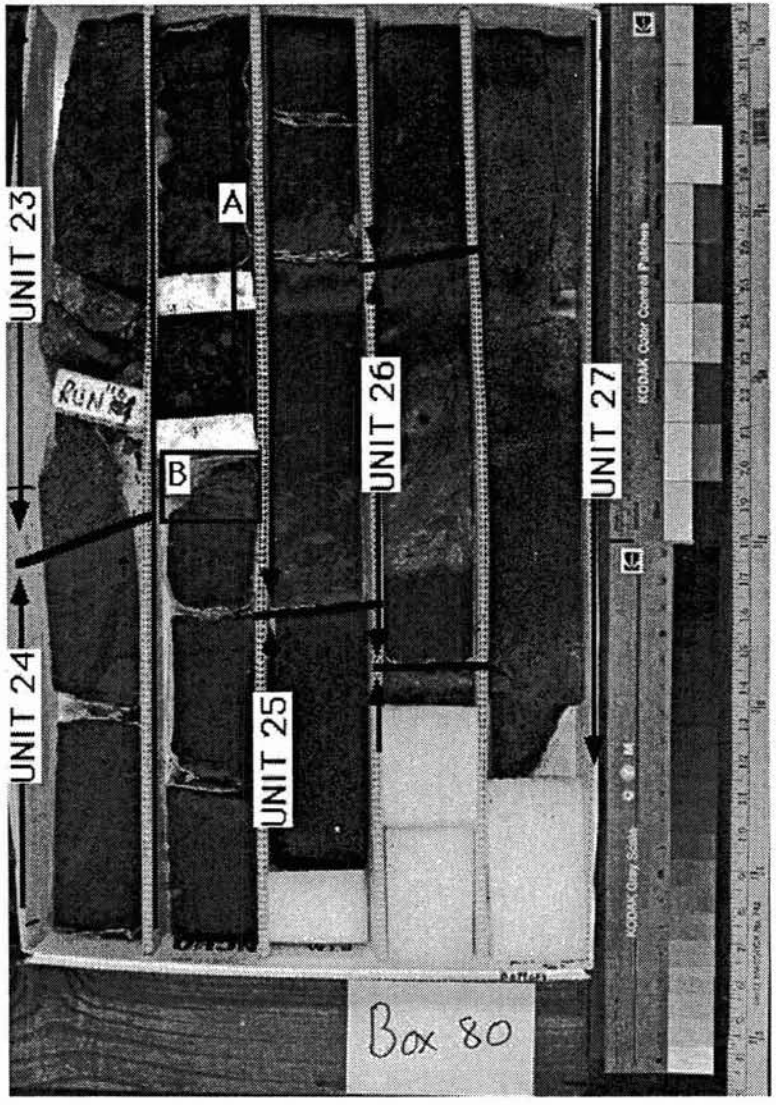
Vesicles: 10-20% – 2-3 mm – rounded to subrounded – equant to elongate–

Alteration: fresh (<2% altered) –

Veins: none

Fractures: weakly fractured: 5/2 ft

Additional comments:
Unit looks very similar to unit 3.



Box #:	Cores in box
81	116 117 118

Loggers:	BM
Date logged:	11/7/93
Checked by:	MG
Check date:	11/10/93

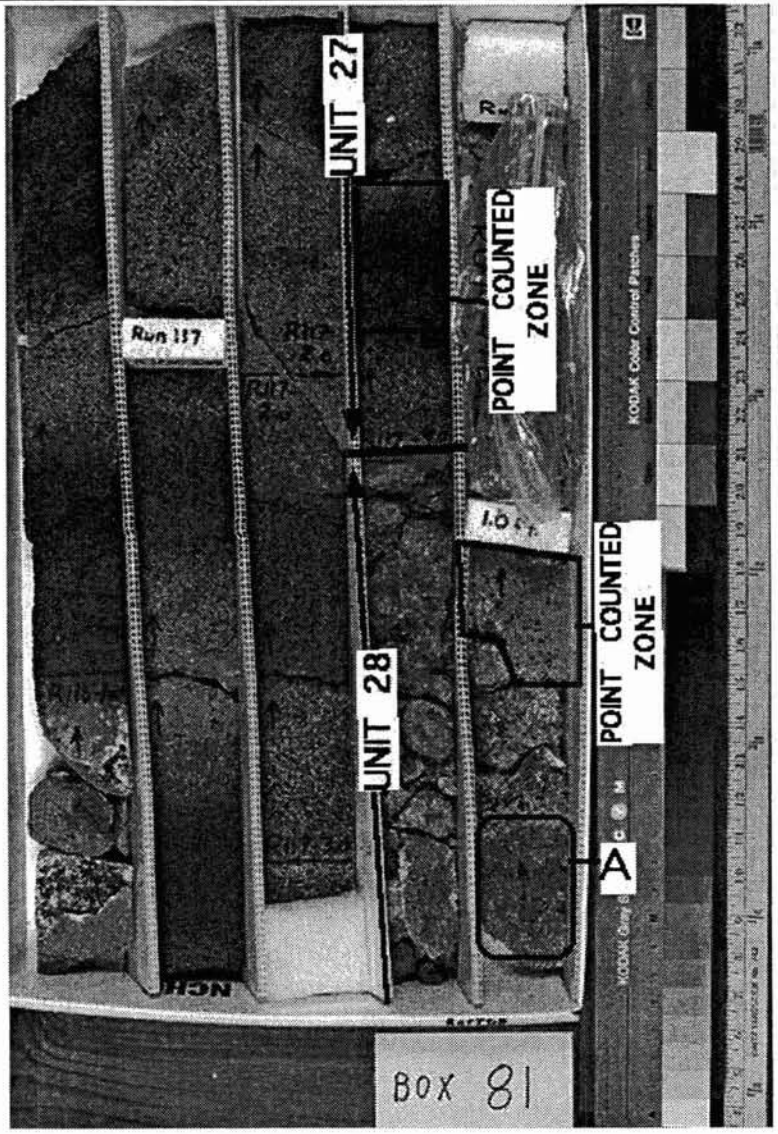
Driller's depth:top [feet]:	602.4
Driller's depth:bottom [feet]:	611.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 27

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R117-4.0-608.2')(flow contact)
Contact is marked by an oxidized flow top. The extent of oxidation/alteration can be observed in the uppermost 1' of unit 2.
Unit type: pahoehoe?
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 2-3 mm – equant –
Point count of 100 grains at base of flow gave a mode of 1%.
– – – –
– – – –
Groundmass/Matrix: medium-grained (1-5 mm) – plagioclase
Color: N4 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – spherical – equant –
Point counting of 100 points near base of flow gave a mode of 17%.
Alteration: –
Veins: none
Fractures: weakly fractured: 10/7 ft
Additional comments:
NaCl ppt

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 28

Contacts: Top (ft): (R 117-4.0-608.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Upper 1' of this unit is highly oxidized and weathered (clinker horizon?). Olivine grains are still obvious.
Unit type: aa?
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 3-5 mm – see below –
Grains range from acicular to equant to blocky. Point counting of 100 points gave a mode of 7%; intergrown with plagioclase
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 to N4, med. to dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1 mm to 10 mm – sub-rounded – horizontally elongated –
Point counting of 100 points gave a mode of 18%.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
Feature "A" is a block of highly vesicular material (possible clinker fragment?). This unit is the beginning of a distinctive basalt which contains acicular olivine. A similar unit has been logged uphole from ca. 440' and 470-490'.



Box #:	Cores in box
82	118 119 120

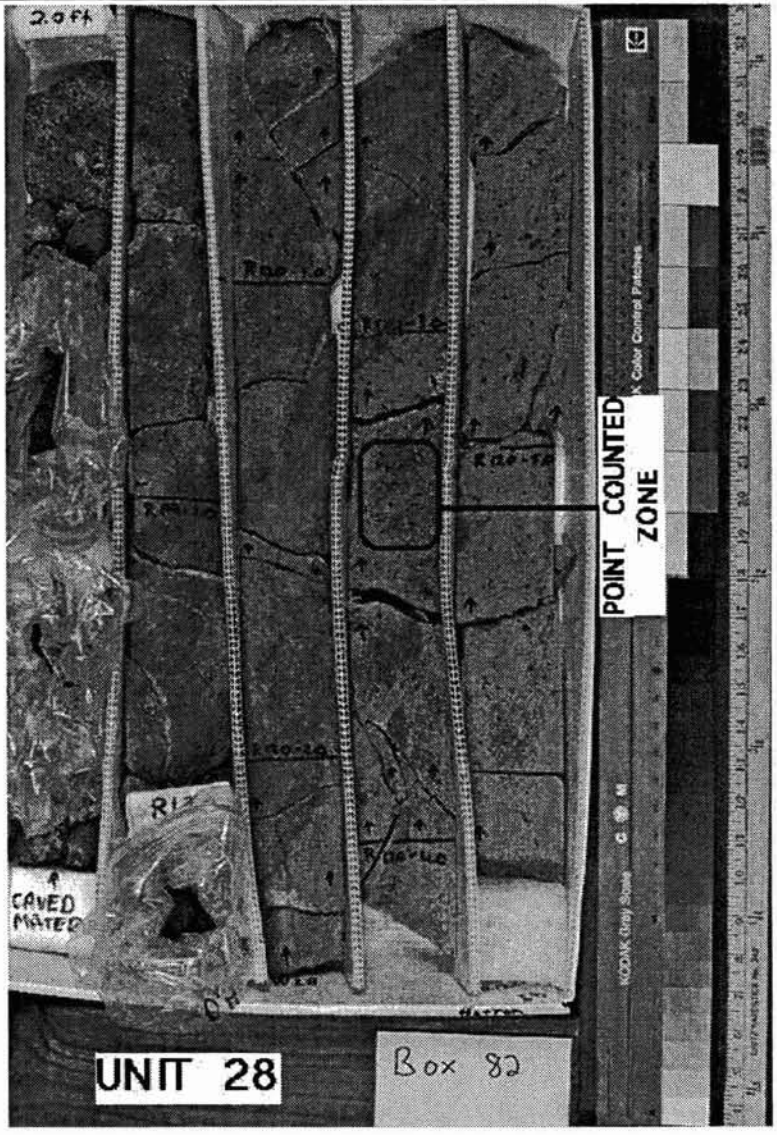
Loggers:	BM
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	611.0
Driller's depth:bottom [feet]:	622.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:28

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa?
contains acicular olivines
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – see below – Mn-oxides along fractures
One point count of 100 points gave a mode of 11%; abundant acicular grains.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5Y 6/1 light olive gray to olive gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-2 mm – sub-angular – randomly elongated –
10 cm thick oxidized zone has 10-20% vesicles at R120-3.5
Alteration: slightly (2-10% altered) – Fe- and Mn- oxides
Veins: none
Fractures: Weakly to moderately fractured: 20/5 ft. Fractures lined with white to buff-colored clay-like material
Additional comments:
NaCl ppt; rubbly, weathered top R119-0.0



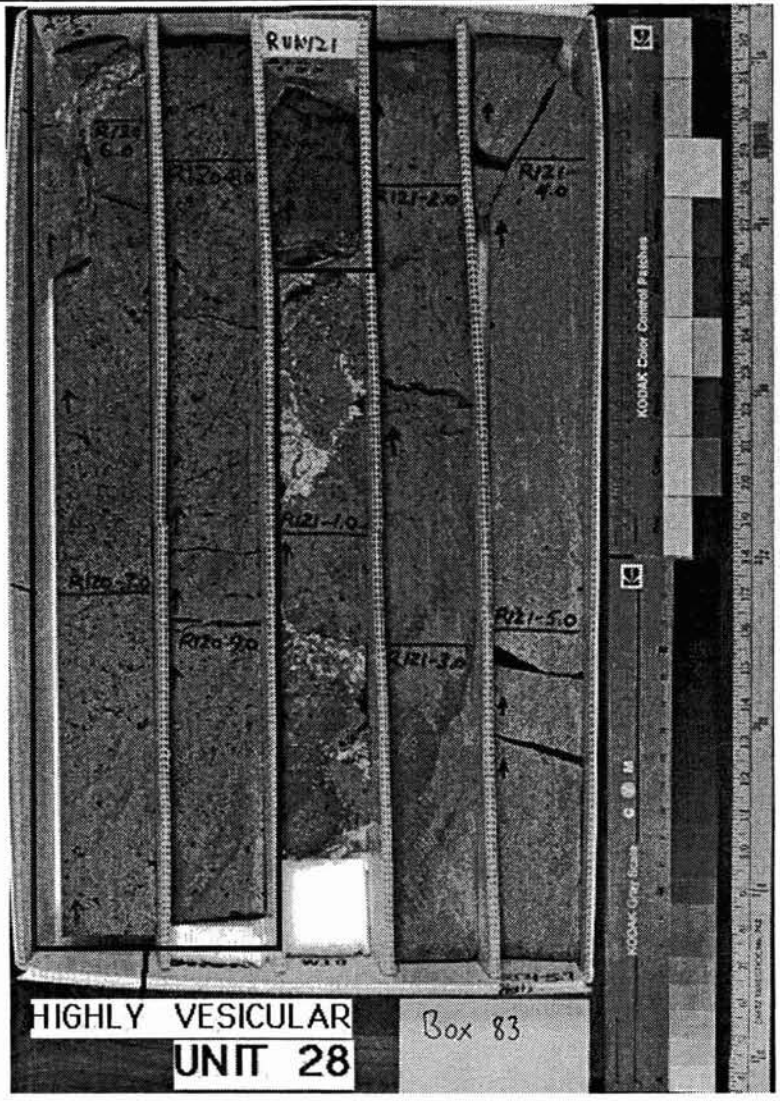
Box #:	Cores in box
83	120 121

Loggers:	JCL
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	622.1
Driller's depth:bottom [feet]:	630.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:28**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – blocky (<3:1:1) – iddingsite(?)
9% point count at R120-9.2, 7% at R121-5.0. Abundant acicular (1-5 mm) olivines not included in count. Red alteration of olivines along grain boundaries and fractures.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: 2-25% – 1-5 mm – irregular – –
Range from 20-25% at top of box down to <2% at bottom of box. Irregular subhorizontal striations suggestive of collapsed vesicles. Larger vesicles are generally sub-horizontally elongate.
Alteration: fresh (<2% altered) –
red oxidation, decreasing with depth
Veins: none
Fractures: weakly fractured with soft white-yellow rind on some
Additional comments:
Color grades from brownish gray (5YR 4/1) at top to light brownish gray/medium light gray at bottom (5YR 6/1 to N6).



Box #:	Cores in box
84	122

Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

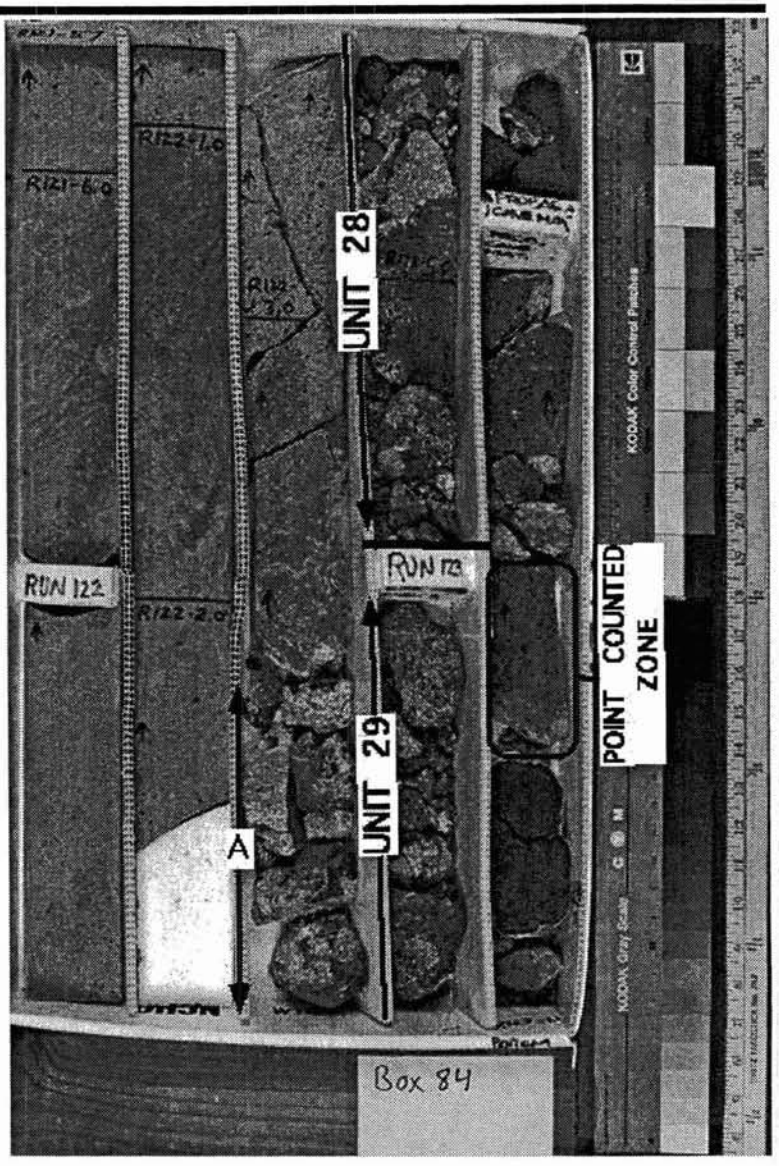
Driller's depth:top [feet]:	630.1
Driller's depth:bottom [feet]:	639.7
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately phyric olivine basalt — UNIT #: 28

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R122-5.3-638.8')(flow contact)
Massive material grades into highly oxidized zone at R122-4.2 (note that ~2 ft are missing at the end of the R122).
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant –
Point count: 9% at R122-0.5. Towards the bottom of the flow some olivines have an acicular habit (<1 mm in length). Olivines contain spinel inclusions.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: <1% in massive portion – 1-5 mm – rounded – –
Highly elongate subangular 5-10 mm flattened vesicles are present between R122-2.0 and R122-3.5 (beginning of rubble zone); within the rubbly zone, vesicles are subangular and 5-10%.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured down to the beginning of the rubbly zone
Additional comments:
See photo: "A" = rubbly zone.

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 29

Contacts: Top (ft): (R 122-5.3-638.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 2-4 mm – equant to tabular – iddingsite, MnO(?)
point count: 9% (see photo for location); olivines appear completely oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: med. red 5 R 4/6 – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-angular – subvertically elongate –
Alteration: very highly (80-95% altered) - oxidized –
Veins: none
Fractures: moderately to highly fractured; is close to being a rubbly zone
Additional comments:



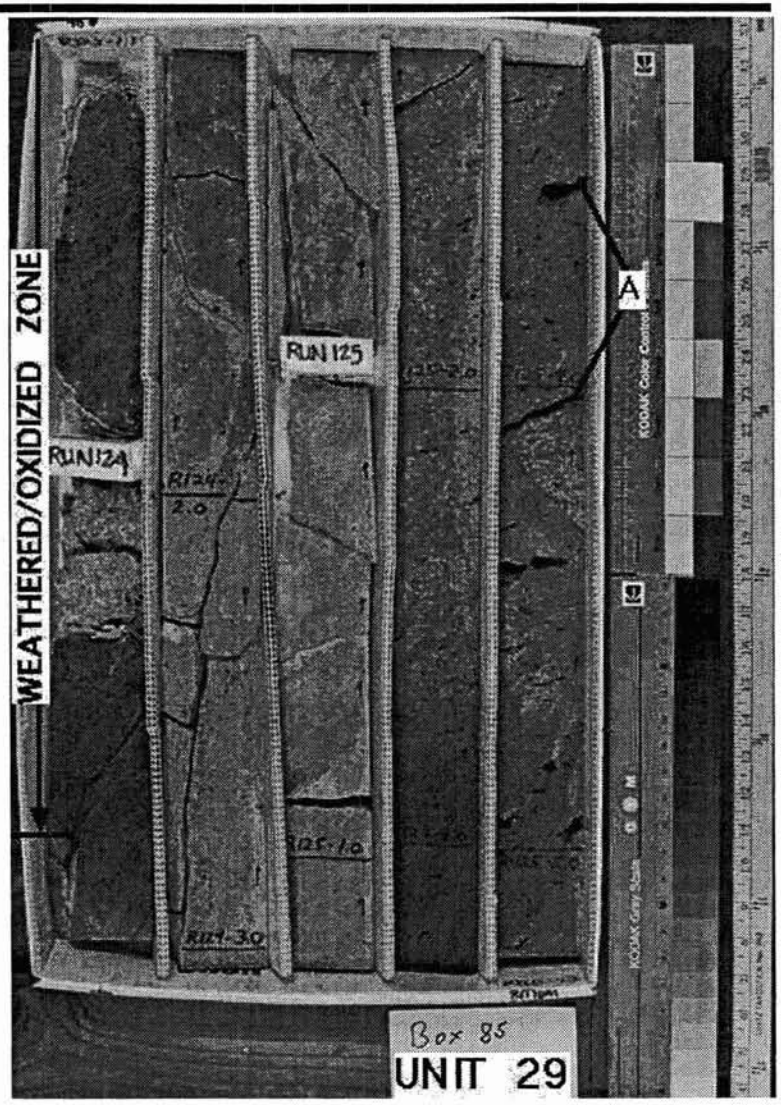
Box #:	Cores in box
85	123 124

Loggers:	JCL
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	639.7
Driller's depth:bottom [feet]:	652.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:29**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubbly, reddish, highly weathered top with hunks of olivine
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – blocky (<3:1:1) –
8% point count at R125-1.0. Abundant acicular microphenocrysts, not included in abundance estimate. Acicular olivines decrease in abundance with depth, becoming rare below R125-0.5. Some olivines altered along rims and fractures to black.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5Y 6/1 light olive gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – irregular – horizontally elongated–
Variable vesicle content ranging from 1% near top to >15%, increasing with depth. Some large vesicles partially infilled with diktytaxitic melt.
Alteration: –
Veins: none
Fractures: Weakly fractured with yellowish-white soft coatings above R125-1.0, diktytaxitic texture along fractures below this. A=vesicles and fractures with infilling of platy/acicular crystals.
Additional comments:



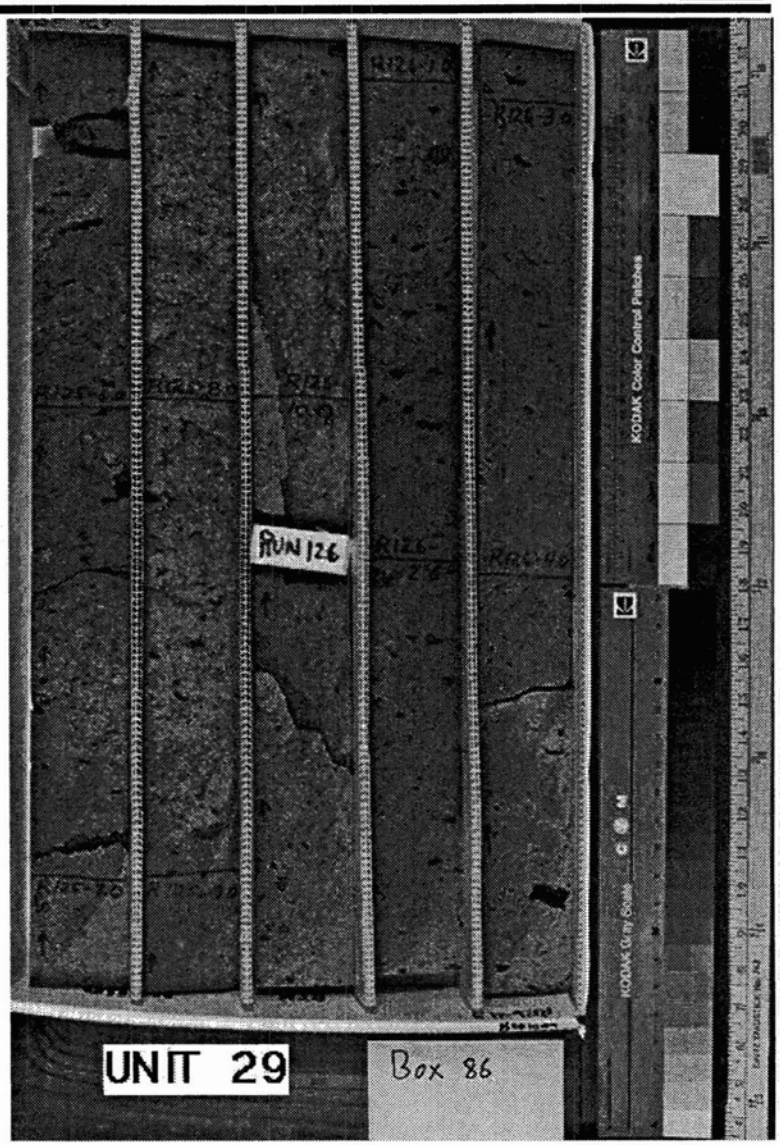
Box #:	Cores in box
86	125 126

Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	652.0
Driller's depth:bottom [feet]:	661.9
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:29**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 2-4 mm – equant to tabular –
Point count: 7% at R125-6.7. Acicular olivines occur throughout the section in box 86 (not included in point count). Degree of olivine oxidation increases from R126-2.0 to the bottom of the box at ~R126-3.0. Towards the bottom some olivines are nearly completely oxidized.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 medium light gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 4-10 mm – subrounded to subangular – elongate–
rare >20 mm sized vesicles/vugs
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 7/9.8 ft
Additional comments:
local vug-filling of plagioclase-olivine vesicular material



Box #: 87

Cores in box
126
127

Loggers: BM
Date logged: 11/7/93
Checked by: MG
Check date: 11/11/93

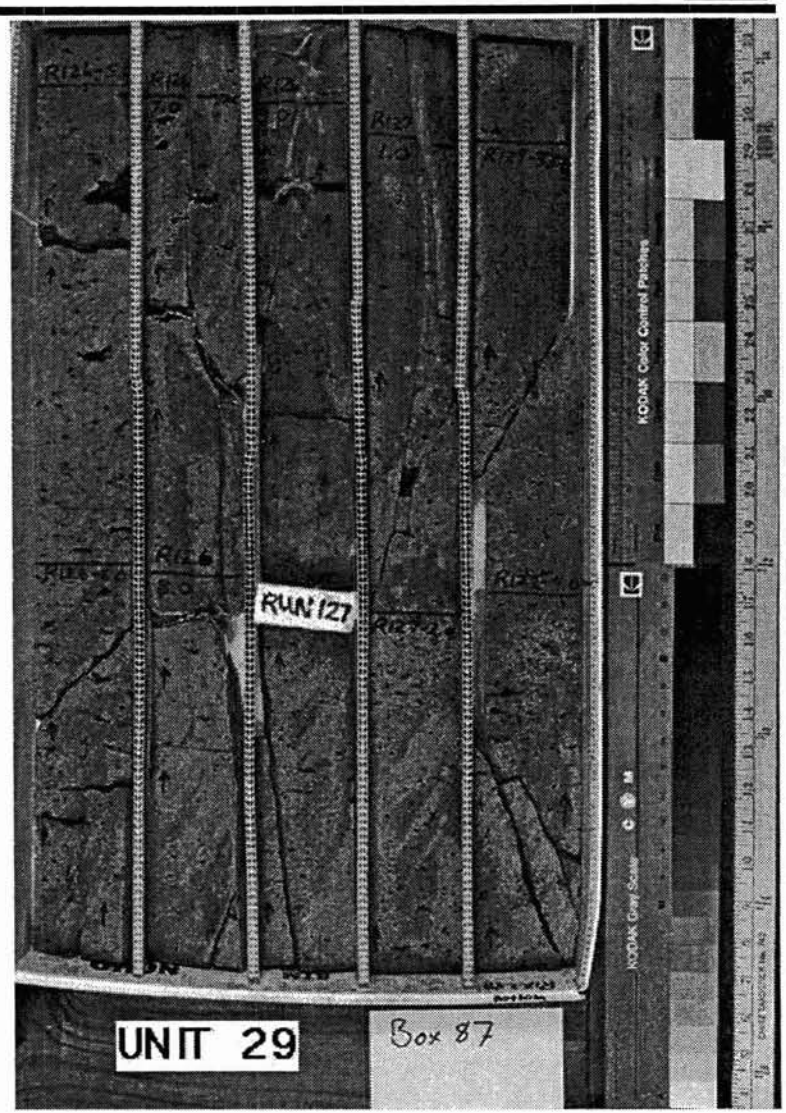
Driller's depth:top [feet]: 661.9
Driller's depth:bottom [feet]: 671.8
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:29

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – –
acicular to equant to blocky olivine grains throughout; Mn-oxides and iddingsite alteration products
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 4/2 grayish red – **Structures:** – **Sorting:** –
Vesicles: 5-10% – >5 mm – sub-rounded to sub-angular – horizontally elongated –
Alteration: slightly to moderately (2-40% altered) –
Veins:
Fractures: weakly fractured: 12/10 ft
Additional comments:



Box #:	Cores in box
88	127 128

Loggers:	JCL
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	671.8
Driller's depth:bottom [feet]:	681.8
Core type:	HQ
Units in box:	3

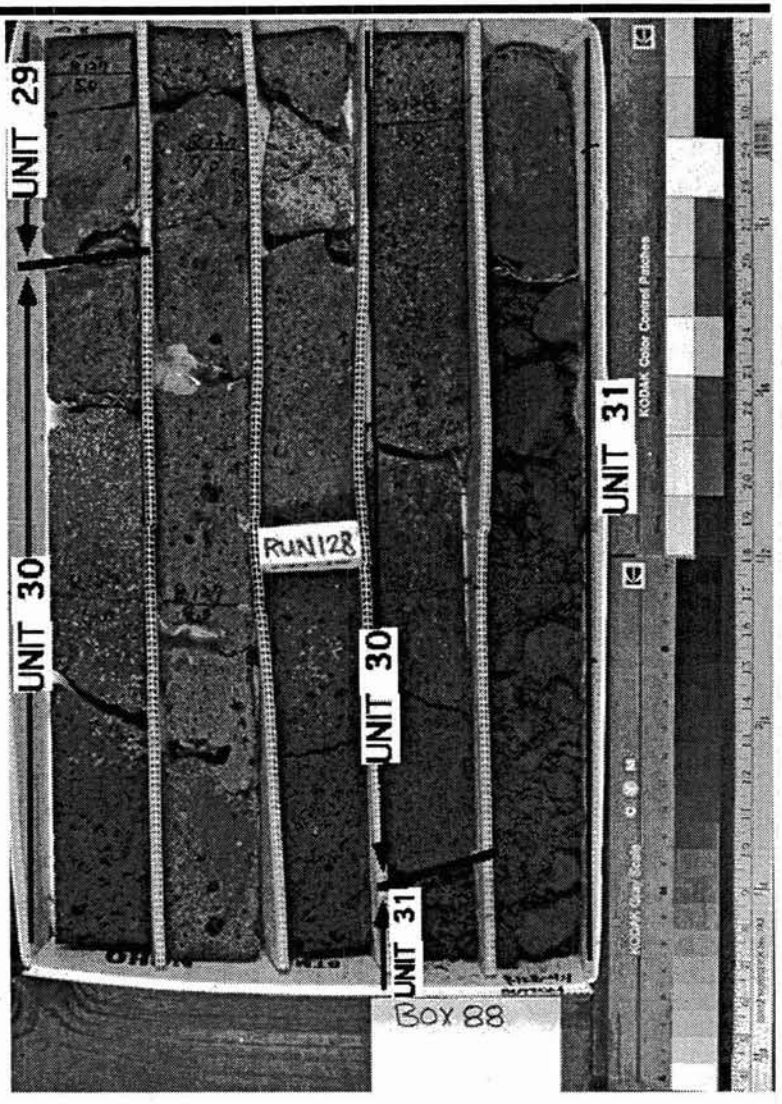
BOX UNIT 1: moderately olivine phyric basalt **UNIT #: 29**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 127-5.4-669.8')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – blocky (<3:1:1) –
7% by point count. Some grains have white alteration.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated –
red-brown color
Alteration: fresh (<2% altered) –
red-some oxidation
Veins: none
Fractures: none
Additional comments:
Acicular olivines abundant near base of flow.

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 30**

Contacts: Top (ft): (R 127-5.4-669.8')(flow contact)
Bottom (ft): (R 128-2.6-677.0')(flow contact with weathered zone)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 30-40% – 1-5 mm – blocky (<3:1:1) –
Olivines highly altered from R128-2.6 to 4.0, become fresher with depth - iddingsitized? Black to red alteration. Point count at R127-8.5 = 37%. Size range 1-10 mm.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: see comments – **Structures:** – **Sorting:** –
Vesicles: – 1-5 mm – irregular to rounded – –
Grades from highly vesicular, horizontally elongate at top and bottom contacts to less vesicular with larger, irregular, equant to vertically elongate in center of unit.
Alteration: moderately (10-40% altered) –
Grades from highly altered at top of unit to less altered interior.
Veins: none
Fractures: weakly fractured with a reddish-white soft coating
Additional comments:
Color grades from dark reddish brown (10R 3/4) at top contact to lighter grayish red (5R 4/2) with depth.

BOX 88 CONTINUED ON NEXT PAGE



Box #: 88

Cores in box
127
128

Loggers: JCL
Date logged: 11/7/93
Checked by: MG
Check date: 11/11/93

Driller's depth:top [feet]: 671.8
Driller's depth:bottom [feet]: 681.8
Core type: HQ

Units in box: 3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 31

Contacts: Top (ft): (R 128-2.6-677.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
This box contains 2 oxidized zones, possibly reflecting upper surfaces of flows; highly oxidized red rubble zone marks top

Unit type: aa
clinker? zone present

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky – Mn-coating in fractures
Spinel inclusions in olivine; olivine crystal clots; olivine appears black near weathered flow boundaries.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 med. gray– **Structures:** – **Sorting:** –

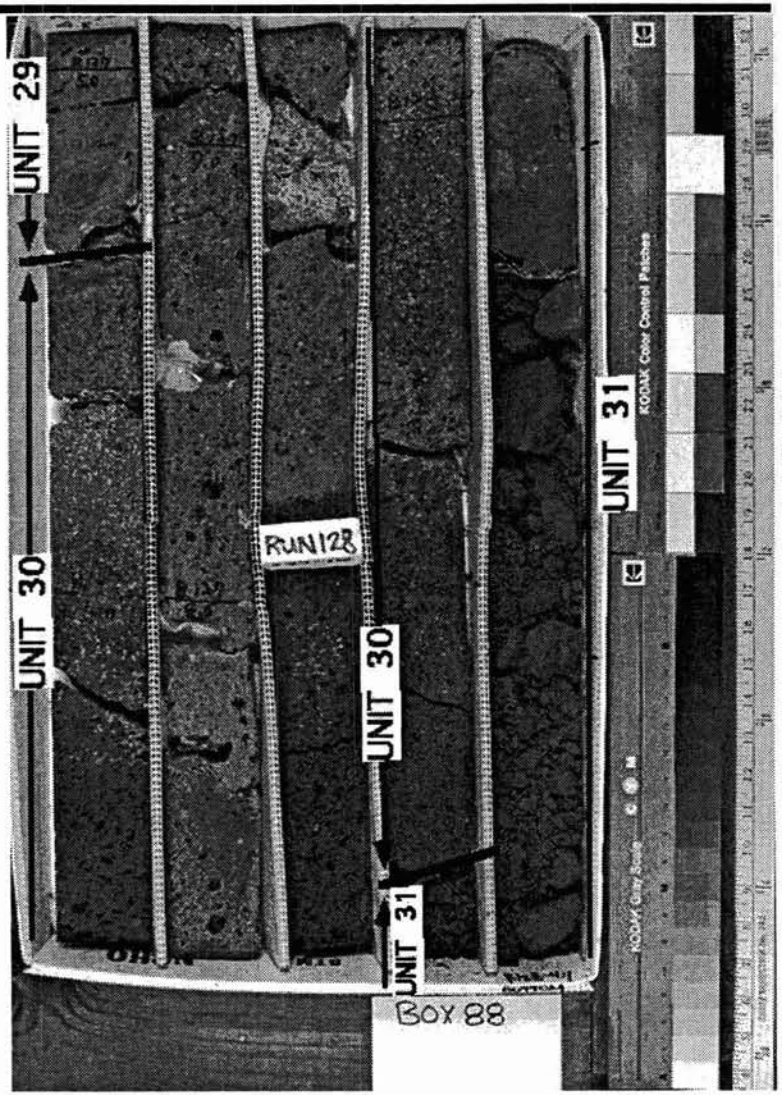
Vesicles: – – rounded – equant–
Varies from <5 to 20-30%, mostly subrounded, equant to horizontally elongate; some pipe vesicles.

Alteration: fresh (<2% altered) – clay
highly oxidized (1-1.5 ft) from flow boundaries

Veins: none

Fractures: weakly fractured

Additional comments:



Box #:	Cores in box
89	128 129

Loggers:	BM
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

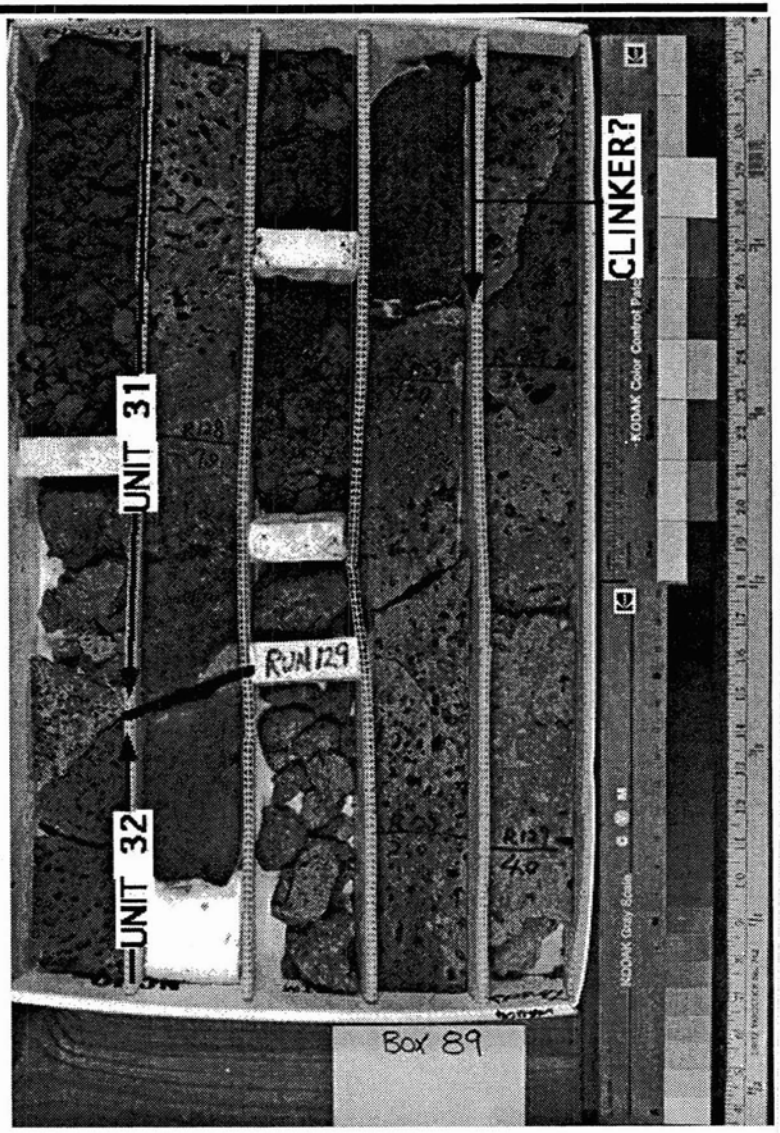
Driller's depth:top [feet]:	681.8
Driller's depth:bottom [feet]:	690.7
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 31

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 128-8.0-682.4')(Reddish soil marks top of lower flow)
This box contains 2 oxidized zones, possibly reflecting upper surfaces of flows.
Unit type: aa
clinker (?) zone present from R129-1.0'
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky – Mn-oxide coats fractures
Spinel inclusions in olivine; olivine crystal clots; olivine appears black near weathered flow boundaries.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: – – – –
Varies from <5 to 20-30%, mostly subrounded, equant to horizontally elongate; some pipe vesicles.
Alteration: fresh to slightly (<2-10% altered) –
highly oxidized (1-1.5') from flow boundaries
Veins:
Fractures: weakly fractured: 11/9 ft
Additional comments:
There are 2 flows in this box, probably aa. Flow 1 is only 3.6' thick. Flow 2 is 6.5' and continues into next box. NaCl ppt on dry core.

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 32

Contacts: Top (ft): (R 128-8.0-682.4')(flow contact)
Bottom (ft): (R--')(continuous with next)
soil horizon at top
Unit type: pahoehoe?
highly vesicular top; small rounded vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-4 mm – –
multi-grain clots
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray– **Structures:** – **Sorting:** –
Vesicles: 5-15% – 2-10 mm – round to sub-round – equant–
Alteration: slightly (2-10% altered) – clay
Veins: none
Fractures: weakly fractured (6/3 ft)
Additional comments:



Box #:	Cores in box
90	129 130

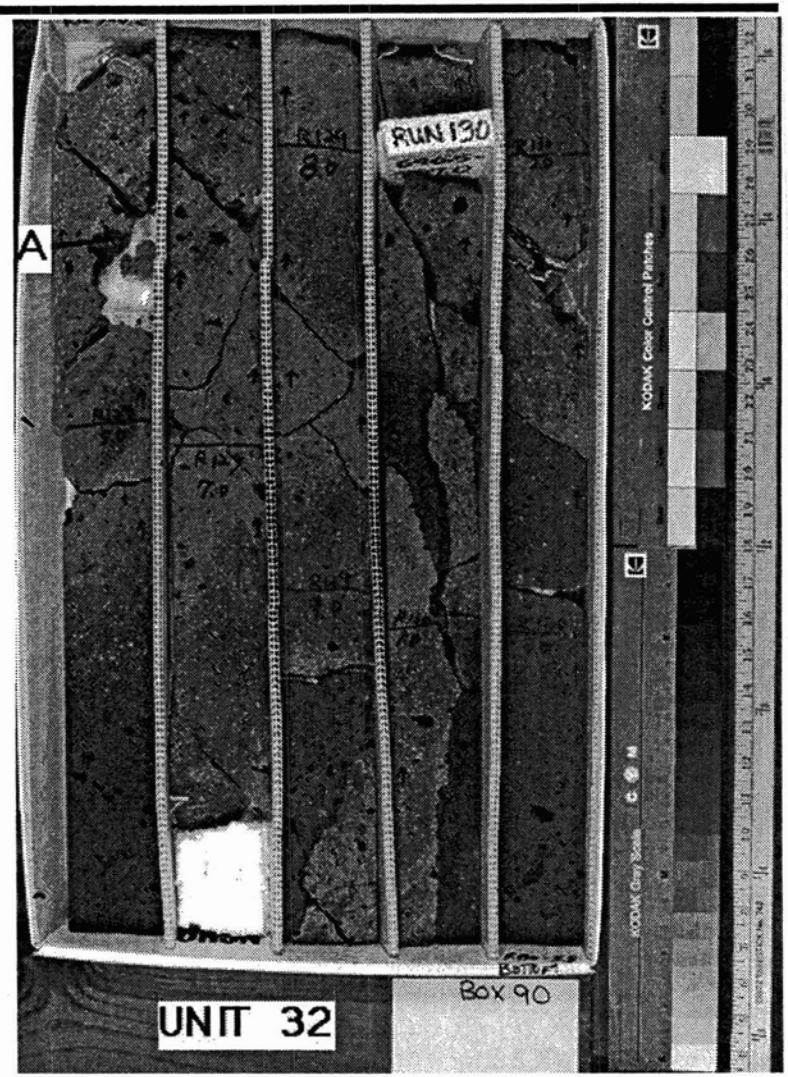
Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	690.7
Driller's depth:bottom [feet]:	700.3
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:32

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-5 mm – equant to blocky – minor iddingsite
Point count: 14% at R129-8.2. Olivines contain spinel inclusions and occur in crystal clots.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-15% – 2-10 mm – rounded to subrounded – equant to elongate (no orientation) –
Alteration: fresh (<2% altered) –
Reddish-brown coating in some of the vesicles and on some of the fracture surfaces.
Veins: none
Fractures: weakly fractured: 25/9.4 ft
Additional comments:
NaCl ppt. "A" = large vug (see photo).



Box #:	Cores in box
91	130 131

Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

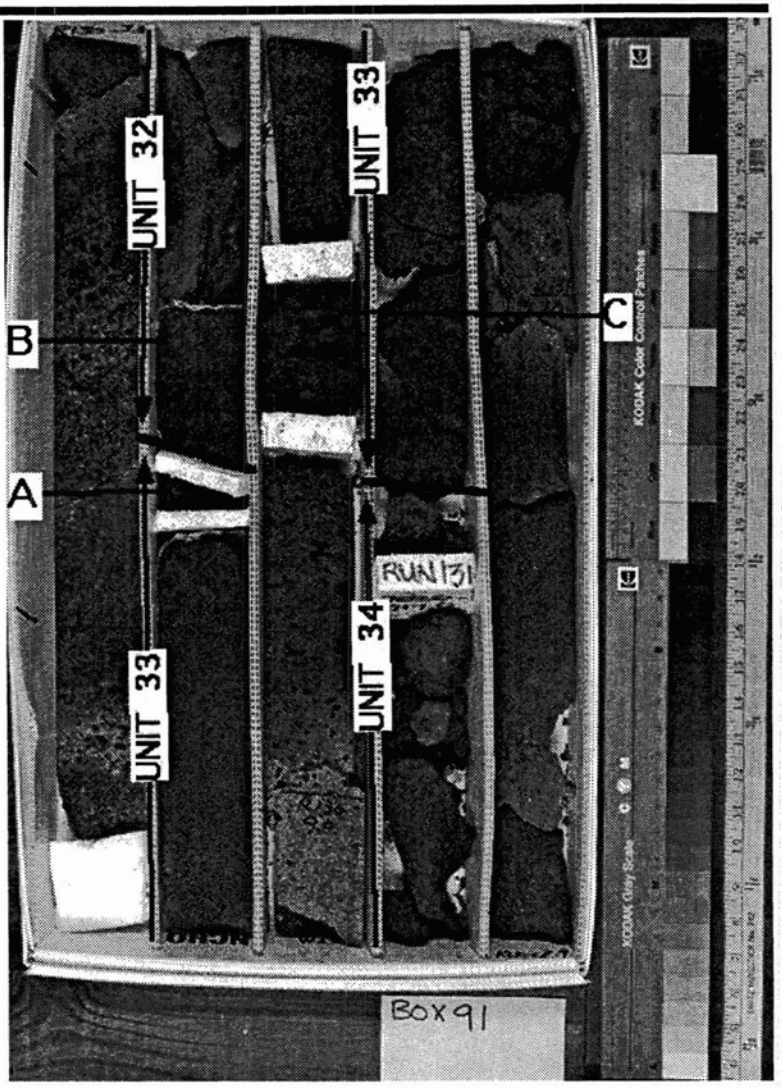
Driller's depth:top [feet]:	700.3
Driller's depth:bottom [feet]:	710.4
Core type:	HQ
Units in box:	3

BOX UNIT 1: highly olivine phyric basalt **UNIT #: 32**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 130-6.1-702.1')(flow contact)
base marked by soil
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-3 mm – equant to tabular – iddingsite
Point count: 22% at R130-4.2. Slight oxidation; spinel inclusions present in some olivines.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: >10% – 1-5 mm – rounded to subrounded – equant to elongate –
See photo for indication of vesicle volume% variation with distance from bottom flow contact.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
see photo: "A" = highly weathered/oxidized zone at the bottom of the flow. "B" = gradational zone of increasing oxidation/weathering.

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 33**

Contacts: Top (ft): (R 130-6.1-702.1')(flow contact)
Bottom (ft): (R 130-10.4-706.4')(flow contact)
flow boundaries defined by highly oxidized vesicular zones; bottom contact has some preserved ropy textures
Unit type: pahoehoe?
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-3 mm – equant to tabular –
Point count: 11% at R130-8.5. Olivines are oxidized near the top and bottom contacts.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: see comments – – – –
Near the top contact the rock is more than 30% subrounded and elongate vesicles that are <1 mm in size. At center of flow (R130-6.8), >1 cm sized vesicles constitute between 5 and 10% of the rock; they are subrounded and subhorizontally elongate. Near the flow bottom, the size decreases to <1 mm.
Alteration: fresh (<2% altered) –
Except near the two contact where the rock is highly oxidized.
Veins: none
Fractures: weakly fractured
Additional comments:
"C" = zone of weathered material/ash(?) infilling a large vug - vesicle size and population does not indicate a flow contact.



BOX 91 CONTINUED ON NEXT PAGE

Box #:	Cores in box
91	130 131

Loggers:	MBB
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	700.3
Driller's depth:bottom [feet]:	710.4
Core type:	HQ
Units in box:	3

BOX UNIT 3: highly olivine phyric basalt **UNIT #: 34**

Contacts: Top (ft): (R 130-10.4-706.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Top contact is somewhat uncertain; oxidized rubbly zone with pieces covered with reddish clay(?) material.

Unit type: massive

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-3 mm – –
Point count: 16% at R131-2.1. Near the contact, olivines are iddingsitized and often have MnO(?) coating.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 med. gray– **Structures:** – **Sorting:** –

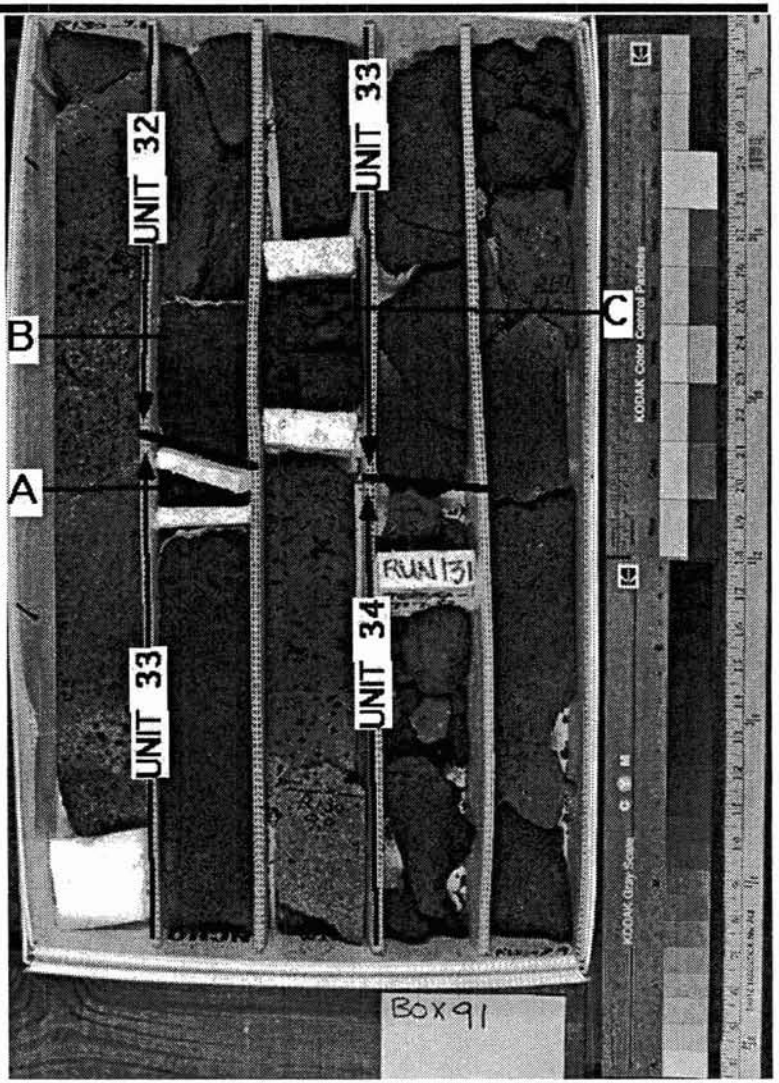
Vesicles: 10-20% – 1-5 mm – – –
Vesicles vary from rounded to highly elongate (flattened).

Alteration: slightly (2-10% altered) - oxidized –
Groundmass has reddish tint.

Veins: none

Fractures: From contact, fracturing varies from high (rubbly zone) to weak.

Additional comments:
J.P. Lockwood and Frank Trusdell comment, 11/19/93: definite Mauna Loa flow



Box #:	Cores in box
92	131 132

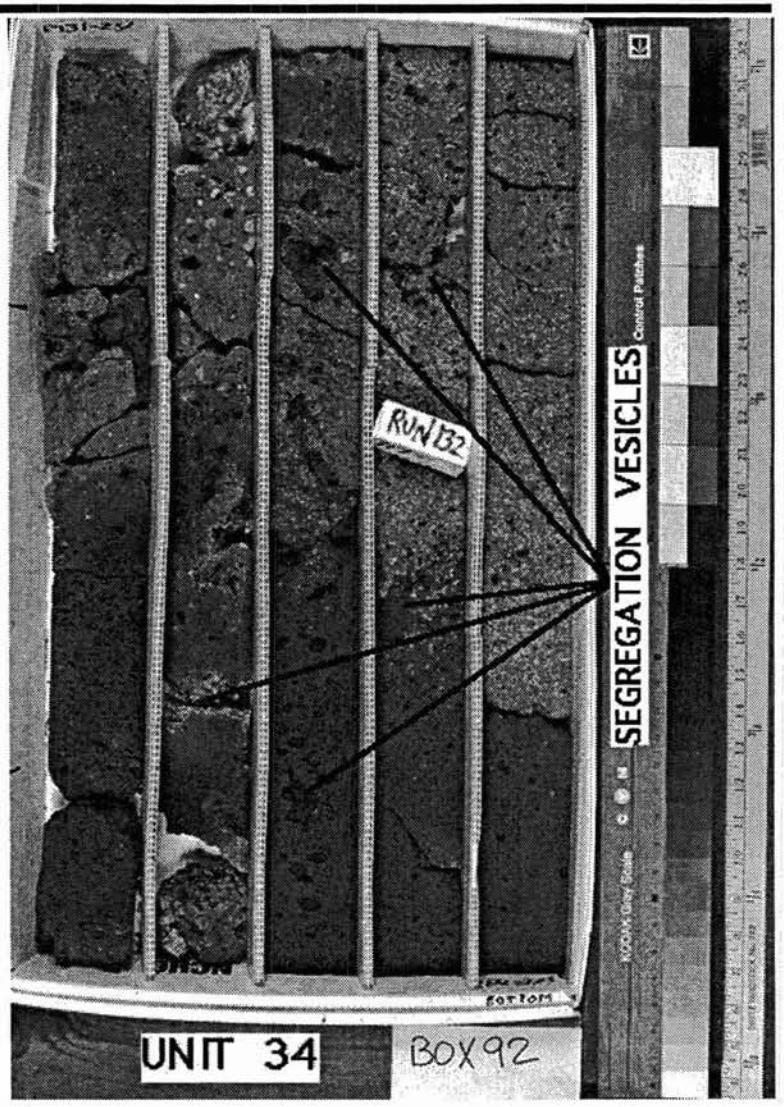
Loggers:	BM
Date logged:	11/7/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	710.4
Driller's depth:bottom [feet]:	720.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:3 4

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
Size varies to 8 mm; counted 13/100.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – >5 mm – spherical to subrounded – equant–
clay where fractures intersect vesicles, feldspar
Large vesicles (up to 6 cm x 3 cm) with secondary basalt liquid infilling. Feldspar in secondary liquid are 1-2 mm long.
Segregation vesicles.
Alteration: fresh to slightly (<2-10% altered) –
Olivines are black (Mn-oxide coatings?) and matrix material is oxidized.
Veins: none
Fractures: weakly fractured: 3/10 ft; clay infilling of fractures
Additional comments:



BOX #:	Cores in box
93	132 133

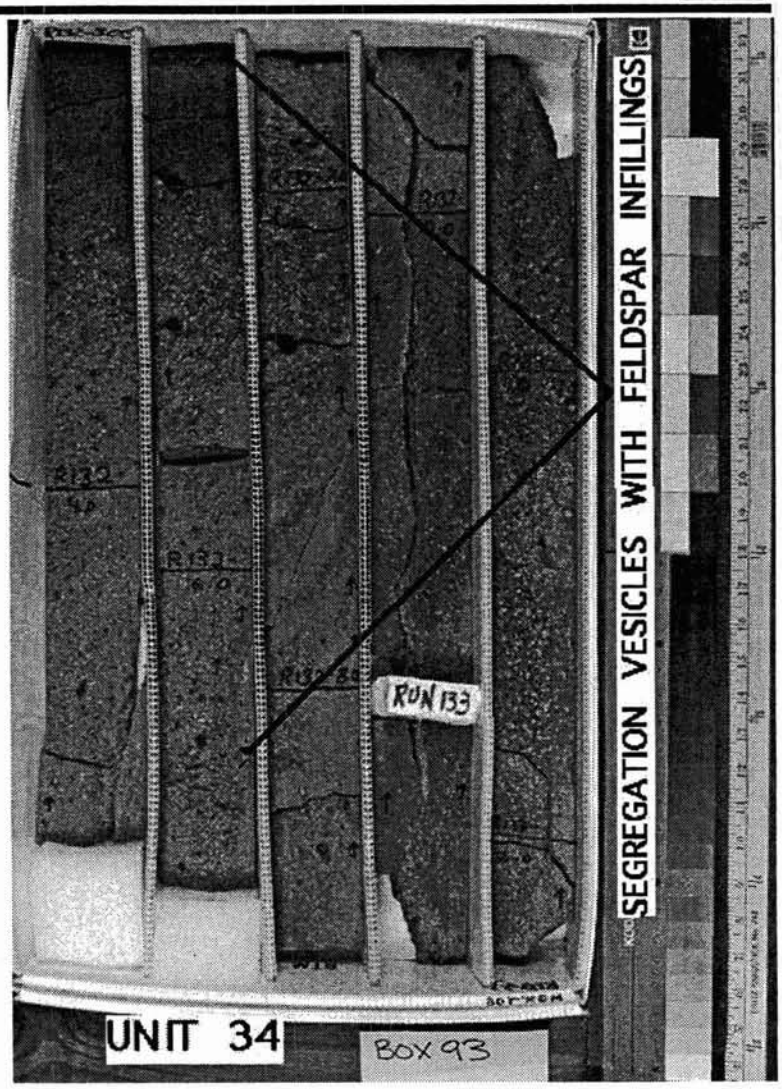
Loggers:	BM
Date logged:	11/8/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	720.0
Driller's depth:bottom [feet]:	729.3
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:3 4

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
Two point counts of 100 points gave modes of 11 and 14%.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – spherical – equant –
Pipe vesicles (horizontally elongate) with feldspar crystals infilling secondary vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 13/9'. Some Fe-oxides along fractures.
Additional comments:
NaCl ppt



Box #: 94

Cores in box
133
134

Loggers: BM
Date logged: 11/8/93
Checked by: MG
Check date: 11/11/93

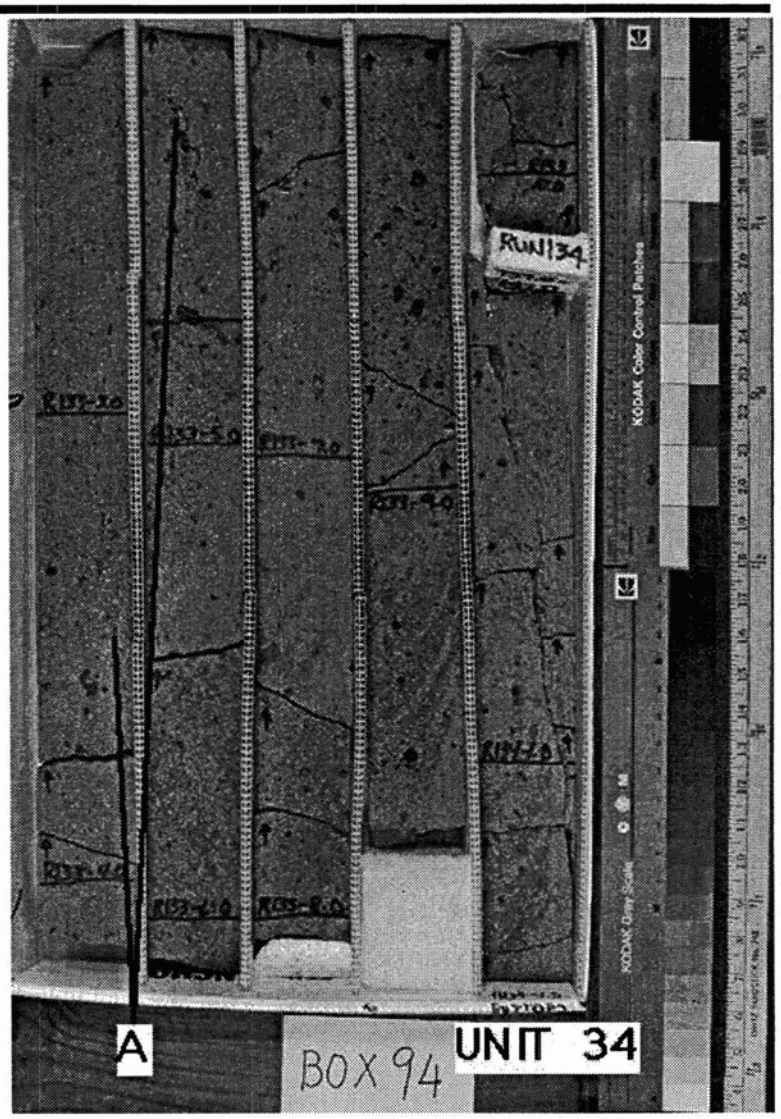
Driller's depth:top [feet]: 729.3
Driller's depth:bottom [feet]: 738.5
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:34

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
Spinel inclusions; olivine clots throughout. Counted 24/100.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% – >5 mm – spherical – equant–
Pipe vesicle "A", (3.2' long) extends down axis of core. Feldspar crystals infill vugs.
Alteration: –
Veins:
Fractures: weakly fractured: 6/9 ft
Additional comments:
NaCl ppt



Box #:	Cores in box
95	134 135

Loggers:	BM
Date logged:	11/8/93
Checked by:	MG
Check date:	11/11/93

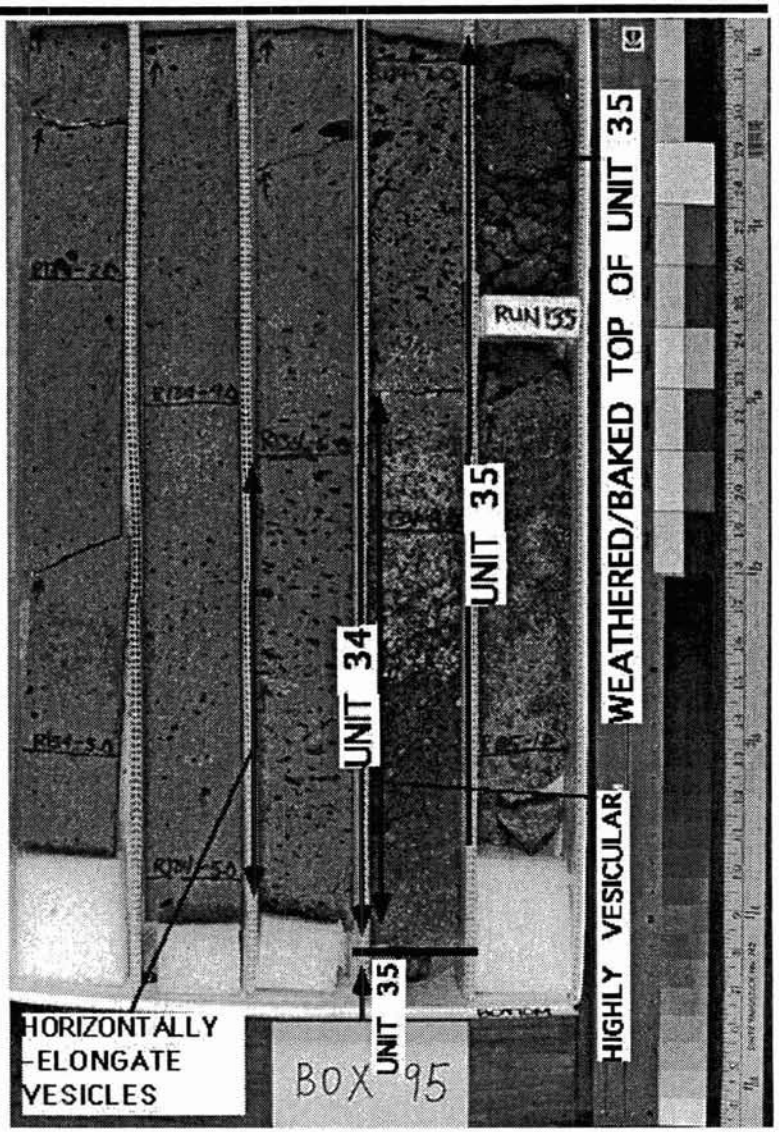
Driller's depth:top [feet]:	738.5
Driller's depth:bottom [feet]:	748.1
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 34

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R134-9.0-745.2')(flow contact)
There are 2 flows with the same lithology in this box. Base of flow 1 (F1) occurs at R134+9.0'. Between F1 and F2, a brown 6" layer of clay-rich weathered basalt is present.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
Minor Mn-staining of olivine near the base of F1 and top of F2. One point count of 100 points near the base of F1 gave a mode of 14%. Spinel inclusions. Some olivines are multigranular and attain a size of 8 mm.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded to rounded – equant to horizontally elongated –
One point count of 100 points near base of F1 gave a mode of 20%.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: 4/10 ft. Minor clay development along some fractures.
Additional comments:

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 35

Contacts: Top (ft): (R 134-9.0-745.2')(flow contact)
Bottom (ft): (R--')(continuous with next)
soil
Unit type: pahoehoe?
vesicular top
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-2 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 1/1 ft
Additional comments:



Box #:	Cores in box
96	135 136

Loggers:	BM
Date logged:	11/8/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	748.1
Driller's depth:bottom [feet]:	764.7
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 35

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R135-7.0-754.0')(continuous with next box)
The rock at the top of this box is part of a flow continued from Box 95. There is no obvious base contact of this flow before it becomes highly oxidized and weathered.

Unit type: massive

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky –
One point count of 100 points gave a mode of 16%. Olivine crystal clots present.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N3 dark gray – **Structures:** – **Sorting:** –

Vesicles: >30% – 1-5 mm – spherical – equant–
Point count of 100 points gave of mode of 35%.

Alteration: fresh (<2% altered) –
Weathering is intensely developed from R135-7.0' to base of box. Fe-oxides and clay minerals predominate.

Veins: none

Fractures: weakly fractured: 5/6 ft

Additional comments:
Run 136 had very poor core recovery (2' over 10' core run). Glass at beginning of run 136. Discussion on whether rubbly glassy fragments are submarine in origin. These fragments are within obvious subaerial contacts. Tentative conclusion is subaerial origin for this unit.
GPLW comment: "palagonitic glass at 749.5 ft [R135-2.5] possibly mark the subaqueous part of a lava delta" (This zone is marked as "oxidized /weathered zones" on the photograph.)

BOX UNIT 2: hyaloclastite/altered fragmental basalt — UNIT #: 36

Contacts: Top (ft): (R 135-7.0-754.0')(weathering horizon)
Bottom (ft): (R--')(continuous with next box)
This logger interprets this unit to be simply a zone of weathering by groundwater. Immediately below this unit is a 27' zone of poor recovery (possibly a fault zone).

Unit type: weathered zone
Weathered "clasts" of basalt, typically poor in vesicle content surrounded by a matrix of clay and Fe-oxides.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to blocky – iddingsite, Mn-oxides
One point count of 100 points gave a mode of 13%.
– – – –
– – – –

Groundmass/Matrix: clay and Fe-oxides –

Color: 5YR 4/4 moderate brown– **Structures:** – **Sorting:** –

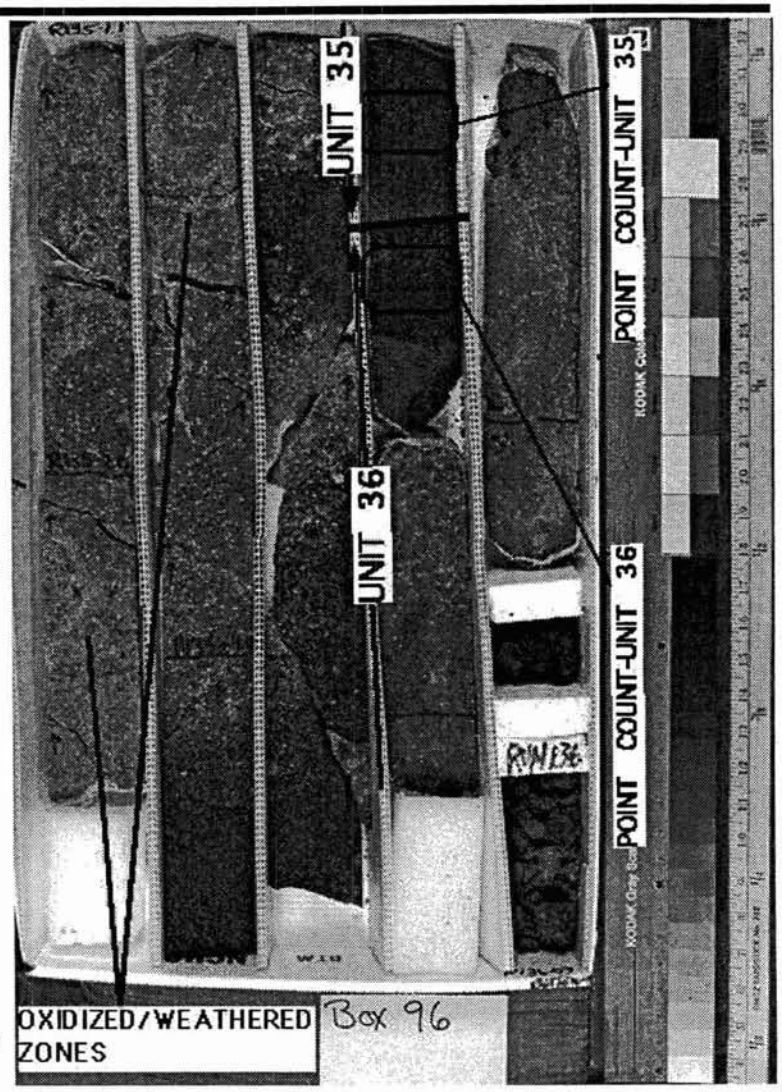
Vesicles: – – – –

Alteration: –

Veins:

Fractures:

Additional comments:
This unit has caused some debate. D. Clague has called it a hyaloclastite, based on his observations of glassy, brecciated volcanic fragments. He has interpreted it to be the basal section of Unit 1 that has flowed into an aqueous body. The extensively developed oxidized, weathered zone in this scenario has occurred in a subaerial environment, requiring either a drop in sea level or uplift of previously subaqueous basalt. This logger has not observed material which can be unequivocally called glass. The dark rims of iddingsitized/oxidized olivine that have been observed in weathered sections throughout the hole can appear glass-like, and this may be what Clague observed. The weathered olivines in this unit have a mode of 13%, compared to 16% in the overlying unaltered basalt. The "volcanic fragments" appear to be breccia clasts within a more highly oxidized/weathered matrix. In sections which grade in weathering intensity from fresh to weathered it has been observed that sections with few, large vesicles are generally less weathered/oxidized than areas with many, small vesicles.
Tarl Mattox and Dave Clague comments, HVO: "looks like fragmental beach, sand and gravel (glassy stuff!) deposited by an active lava entry to us! Fragments are all glassy-vesicular with occasional olivine crystals. Also big globular vesicles in some of fragments; classic seawater in semi-molten fragments off active entry."
GPLW comments: "hyaloclastite at 754-767' and palagonitic glass at 749.5' possibly mark the subaqueous parts of a lava delta"



Box #:	Cores in box	
97	136	139
	137	140
	138	142

Loggers:	BM, MG
Date logged:	11/9/93
Checked by:	MG
Check date:	11/11/93

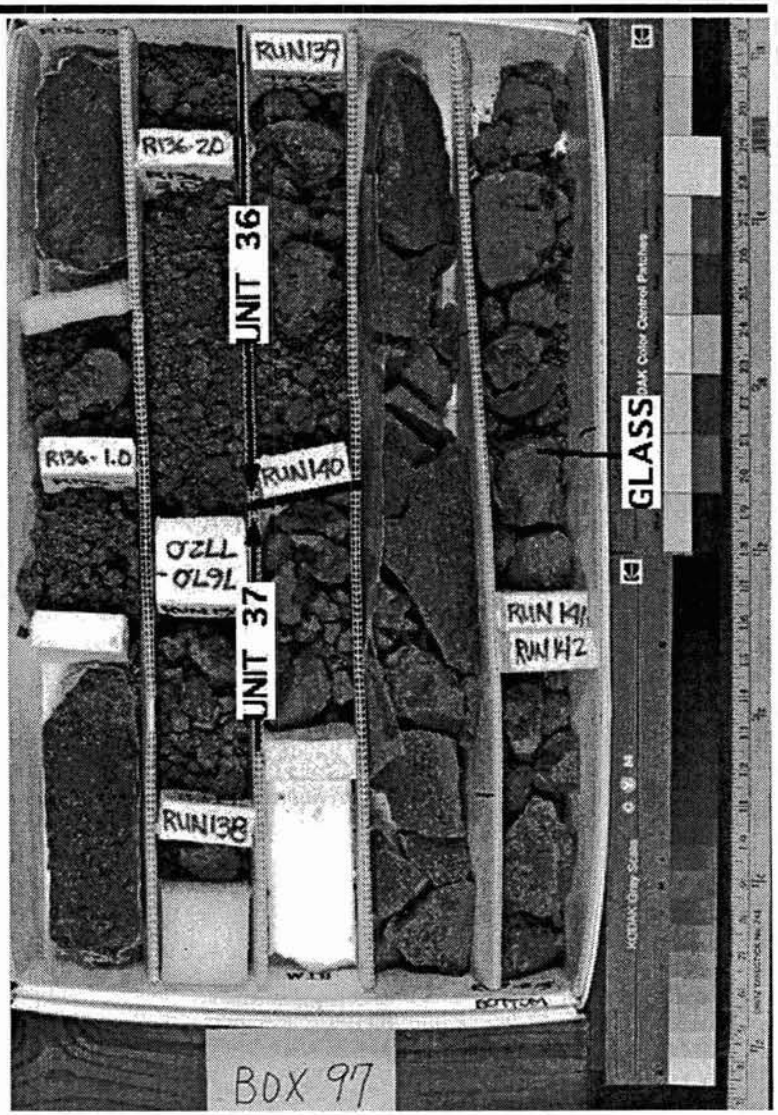
Driller's depth:top [feet]:	764.7
Driller's depth:bottom [feet]:	790.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: hyaloclastite/altered fragmental basalt — UNIT #: 36

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 140-0.0-784.0')(flow contact)
Poor recovery for the majority of this box. Flow contact picked at top of coherent pahoehoe unit but no lithologic change.
Unit type: rubble
Weathered zone; refer to Box 96, Unit 2 for a comprehensive description of the textures in this unit.
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-3 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: mixed – **Structures:** – **Sorting:** –
Vesicles: >30% – – – –
Alteration: moderately (~50% altered) –
Veins: none
Fractures: rubble
Additional comments:
Run 139 contains ropy textures in a highly oxidized, weathered rubble zone. Could the extensive weathering/rubbly nature from 767-789' be due to drilling of a fault zone? Evidence for this is the highly fractured nature of the core from 789-820'.

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 37

Contacts: Top (ft): (R 140-0.0-784.0')(flow top/weathered zone)
Bottom (ft): (R--')(continuous with next box)
Fragment of pahoehoe flow top at R140-base.
Unit type: pahoehoe
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant to blocky –
One point count of 100 points gave a 5% mode.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1 mm – spherical – equant–
Alteration: slightly to moderately (2-40% altered) –
oxidized along fractures
Veins: none
Fractures: Moderately fractured (18/3 ft). Clay and Fe-oxides occur along fractures.
Additional comments:
Glassy flow top at base of R140.



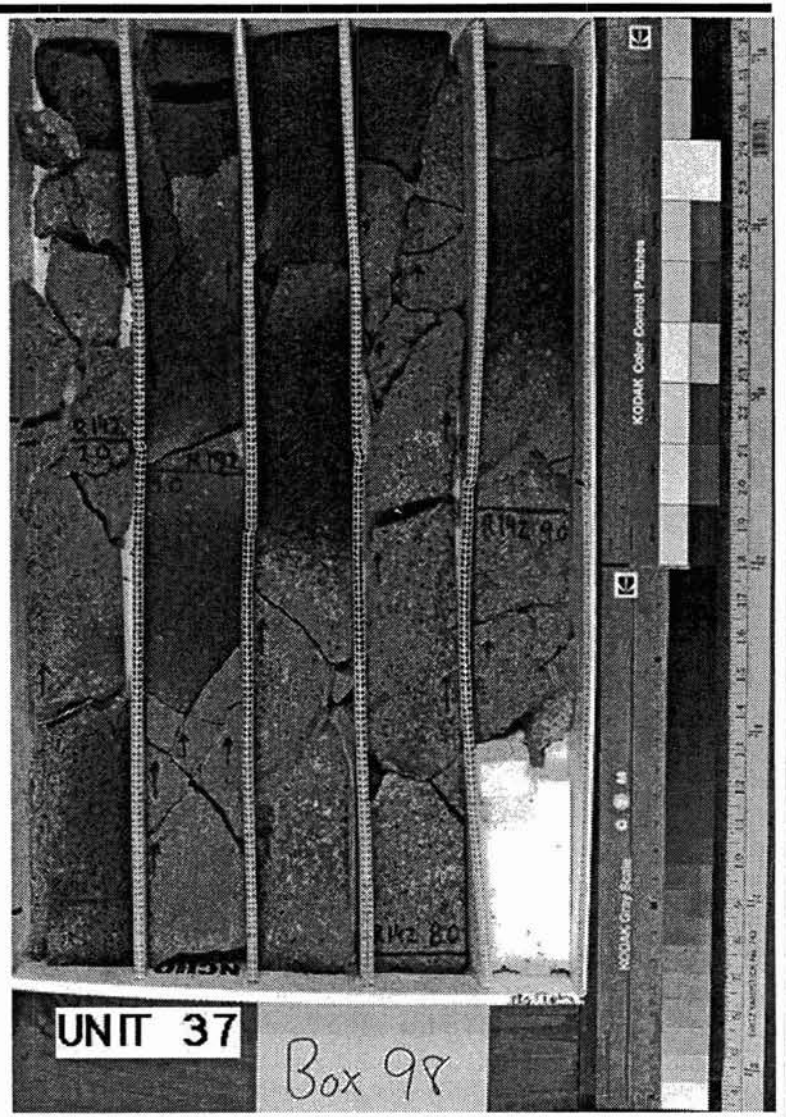
Box #:	Cores in box
98	142

Loggers:	MBB
Date logged:	11/9/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	790.0
Driller's depth:bottom [feet]:	799.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately to highly olivine phyric basalt **UNIT #:37**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately to highly phyric (2->10%) –
olivine – 7-11% – 1-5 mm – equant to blocky –
Point count: 7% at R142-1.5; 11% at R142-8.5. Some olivines contain spinel inclusions.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 2-4 mm – rounded – equant–
Vesicles are uniformly distributed.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: moderately fractured: 36/8.5 ft
Additional comments:
NaCl ppt



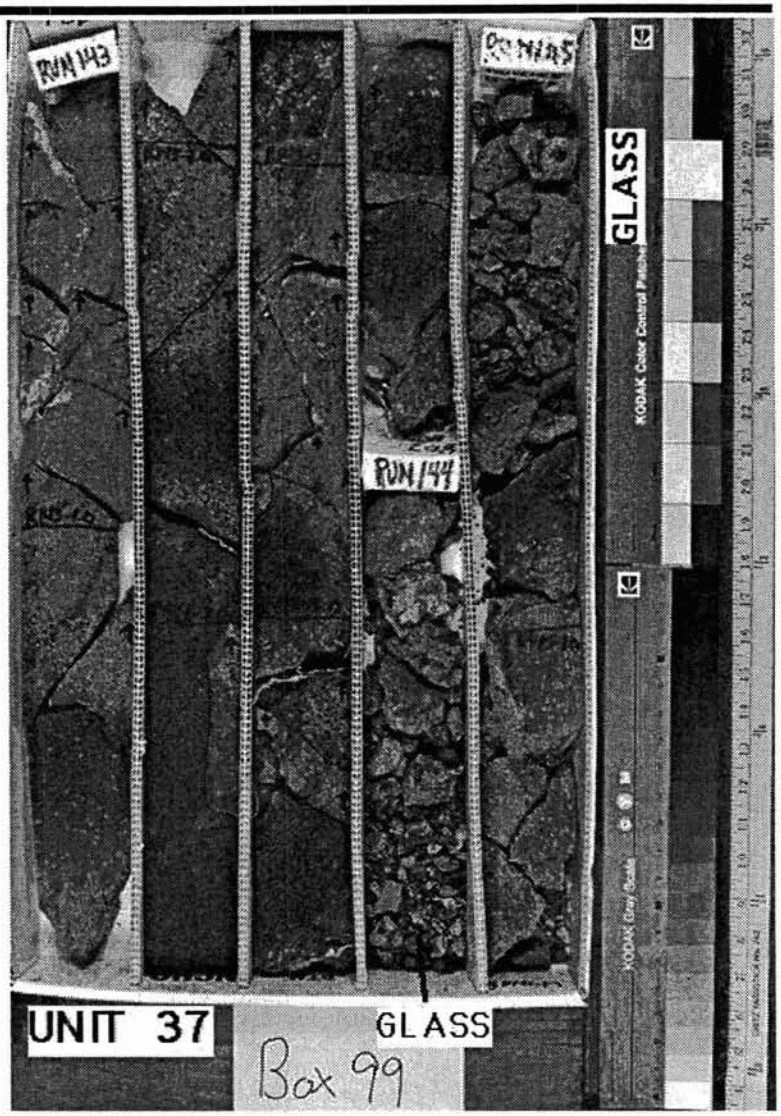
Box #:	Cores in box
99	143 144 145

Loggers:	JCL
Date logged:	11/9/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	799.0
Driller's depth:bottom [feet]:	810.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:37**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Brown oxidized rubbly material with possibly some glass from R144-0.0 to R145-1.0, but no lithology change or change in vesicularity.
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-10% – 2-4 mm – equant to tabular –
Point counts at R143-1.6 and R143-3.6 gave 10% and 6%, respectively.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – rounded – equant–
Slightly vertically to sub-vertically elongate, increasing in size with depth.
Alteration: –
Veins: none
Fractures: moderately fractured: 32/6.5 ft; subhorizontal and some vertical sets, soft yellowish-white coating
Additional comments:
Glassy rubble (2-4 mm thick) R144-0.0 to R145-0.5. No lithologic change across this zone.



Box #:	Cores in box
100	145 146

Loggers:	BM
Date logged:	11/9/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	810.0
Driller's depth:bottom [feet]:	819.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:37

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
interior of pahoehoe? flow
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 4-6 mm – equant to blocky –
Olivine clots; point count of 100 points gave a mode of 8%; max. size=10 mm.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – spherical – equant–
counted 12/100 pts
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Moderately fractured: 49/9.5 ft. Clay minerals occur as fracture coatings.
Additional comments:
Top of Run 146—glassy cave material (looks like glassy material at top of Run 145).

Box #:	Cores in box
101	146 147 148

Loggers:	BM
Date logged:	11/9/93
Checked by:	MG
Check date:	11/11/93

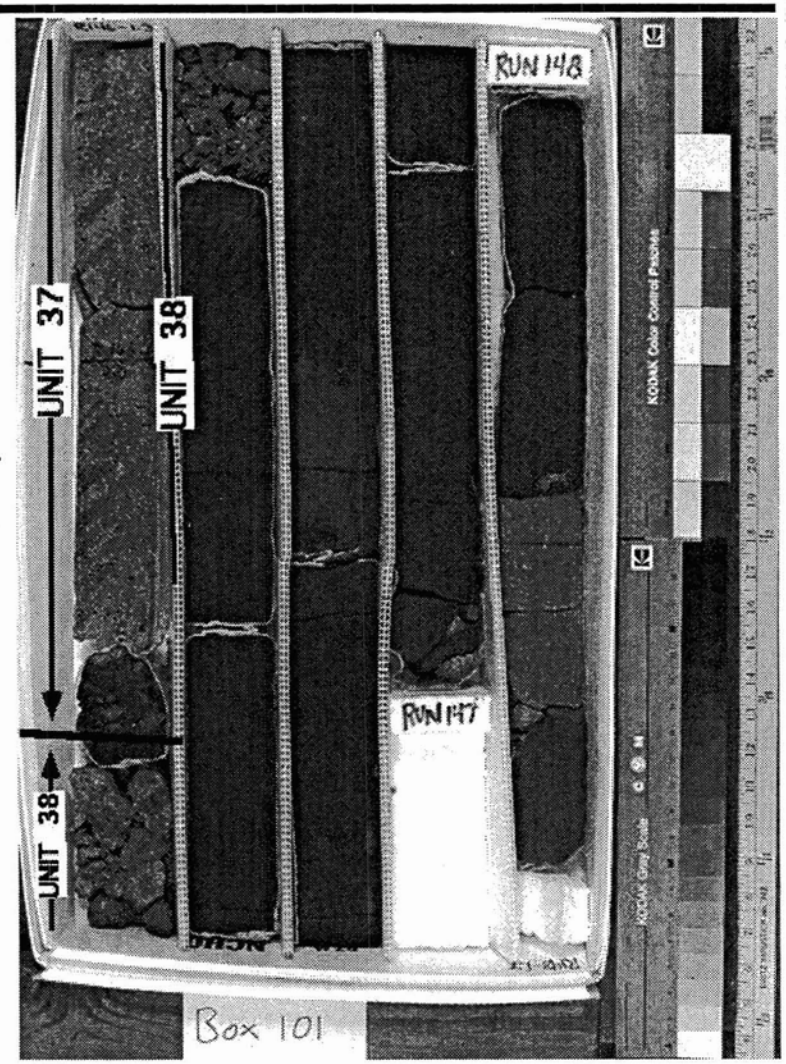
Driller's depth:top [feet]:	819.5
Driller's depth:bottom [feet]:	843.8
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 37

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 146-2.6-820.1')(flow contact)
Bottom contact contains horizontally elongated, sheared vesicles at base of basalt unit; contact itself consists of angular fragments of basalt in a matrix of sandy material.
Unit type: pahoehoe? base
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant –
– – – –
– – – –
Groundmass/Matrix: glassy? to microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-2 mm – spherical to sub-rounded – equant to horizontally elongated –
Alteration: fresh (<2% altered) –
Veins:
Fractures: Weakly to moderately fractured. Clay minerals coating fractures.
Additional comments:
Some glassy margins on rock fragments at base.

BOX UNIT 2: volcaniclastic sand (green) — UNIT #: 38

Contacts: Top (ft): (R 146-2.6-820.1')(depositional)
Bottom (ft): (R--')(continuous with next)
Unit type: volcaniclastic sediment
Horizontal laminations of light colored sand occur at the top of this unit, and eventually grades down into the lower portion of this unit (?unclear, EMS).
Phenocrysts/Clasts:
– No microfossils observed, however sponge spicules are common. Some calcite.
olivine – – – –
volcanic clasts – – – –
weathered/altered clasts.
magnetite – – – –
Groundmass/Matrix: sand sized particles –
Color: 5YR 3/4 mod. brown – **Structures:** bedded (thin) to unbedded – **Sorting:** well-sorted –
Vesicles: N/A – – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: none
Additional comments:
In dried sections of core, a random network of elongated tubular structures were observed, possible worm burrows or bioturbation traces. There are some carbonate grains in this unit, but no microfossils. "Olivine beach".
GPLW comment: "a sand deposit at 823-846 ft looks like a sand dune deposit and contains what appear to be calcified plant rootlets" [could these be NaCl ppt?]



Box #:	Cores in box
102	148 149 150

Loggers:	MG
Date logged:	11/11/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	843.8
Driller's depth:bottom [feet]:	858.9
Core type:	HQ
Units in box:	3

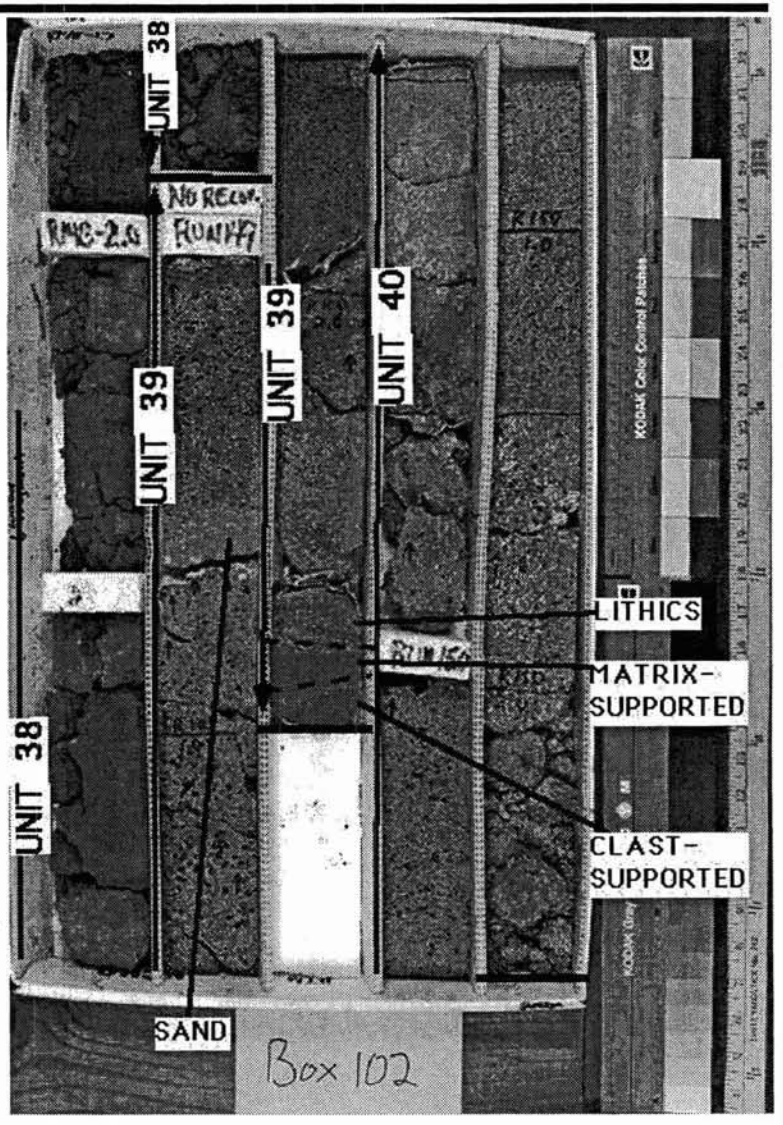
BOX UNIT 1: volcaniclastic sand — **UNIT #: 38**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R149-0.0-847.0')(missing)
1 ft. gap between sand and lava below
Unit type:
Phenocrysts/Clasts:
–
– – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: 5YR 3/4 mod. brown – **Structures:** unbedded – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: –
Veins: none
Fractures: none
Additional comments:
gray sand beach

BOX UNIT 2: sparsely olivine phyric basalt — **UNIT #: 39**

Contacts: Top (ft): (R 149-0.0-847.0')(missing)
Bottom (ft): (R149-3.0-850.0')(depositional)
soil separates flows of different lithology
Unit type: pahoehoe
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-5 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: med. gray– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – spherical – elongate–
Alteration: fresh (<2% altered) – clay-like material
Veins:
Fractures: moderately: 9/1.5 ft
Additional comments:
Internal contacts of sandy material and abundant vesicles.
F. Trusdell comments, 11/19/93: as indicated on the photo, the zone from R149-2.7 to 3.0 is identified as part of a complex pyroclastic unit with an upper zone rich in lithic clasts, a middle matrix-supported zone, and a lower, glass rich, clast supported zone, likely related to the soil/ash identified at the top of underlying Unit 40

BOX 102 CONTINUED ON NEXT PAGE



Box #:	Cores in box
102	148 149 150

Loggers:	MG
Date logged:	11/11/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	843.8
Driller's depth:bottom [feet]:	858.9
Core type:	HQ
Units in box:	3

BOX UNIT 3: highly olivine phyric basalt

Contacts: Top (ft): (R 149-3.0-850.0')(depositional)
Bottom (ft): (R 150-2.5-855.5')(flow contact)
soil on top

Unit type: massive

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant –
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: med. gray– **Structures:** – **Sorting:** –

Vesicles: 10-20% – ~1 mm – spherical – equant–
bimodal; ~1 mm and 3-5 mm

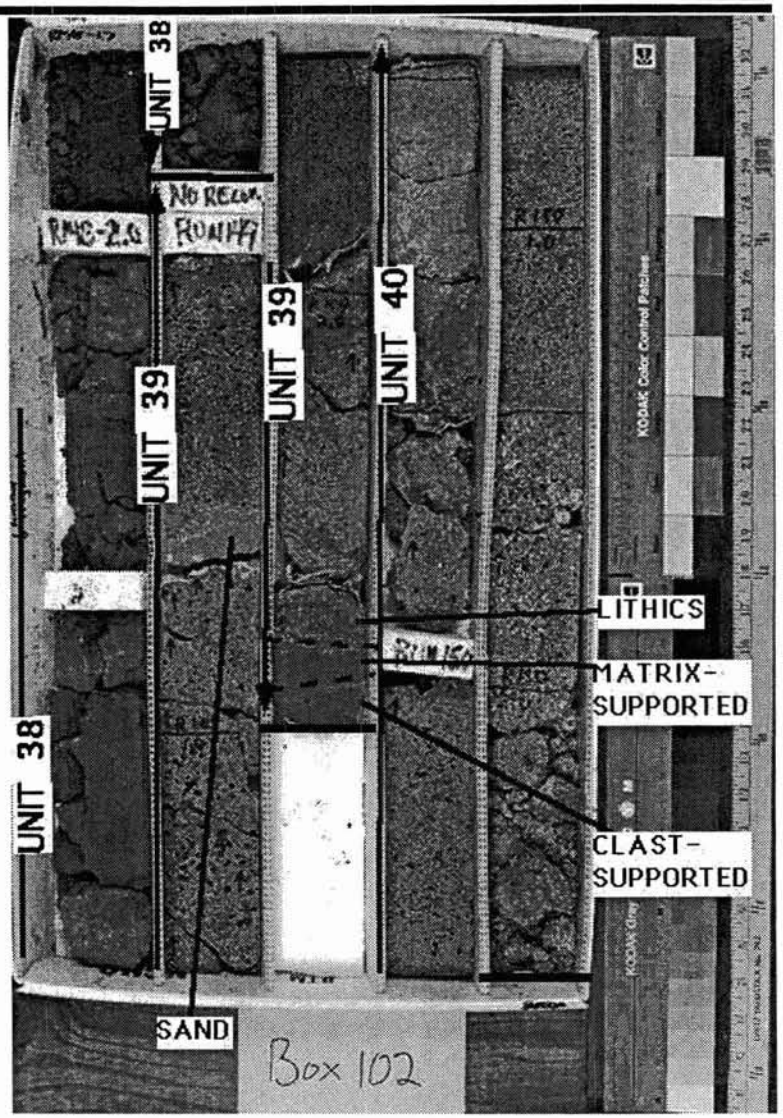
Alteration: fresh (<2% altered) –

Veins: none

Fractures: weakly fractured

Additional comments:
Soil?/Ash is 10 YR 4/6 (gray orange).

UNIT #: 40



Box #: 103

Cores in box
150
151

Loggers:	JCL
Date logged:	11/9/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	858.9
Driller's depth:bottom [feet]:	868.2
Core type:	HQ
Units in box:	3

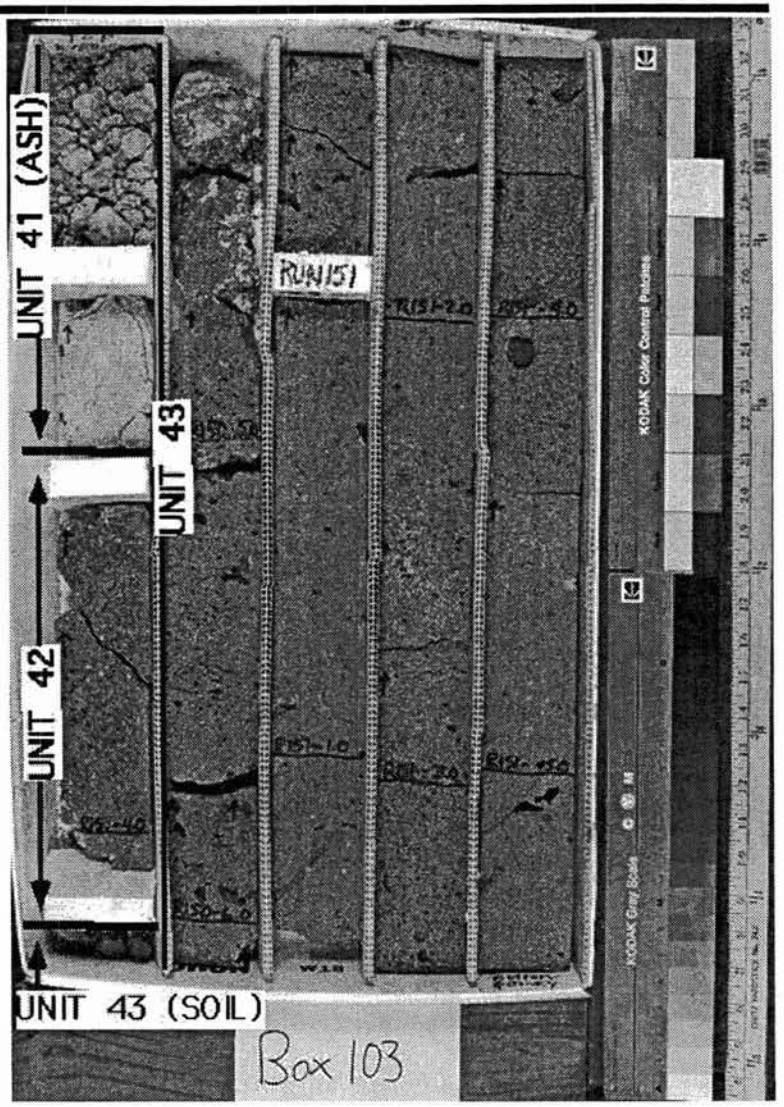
BOX UNIT 1: weathered ash — UNIT #: 41

Contacts: Top (ft): (R 150-2.5-855.5')(flow contact)
Bottom (ft): (R150-3.3-856.3')(depositional)
Unit type: ash
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – <1% – <1 mm – rounded –
Concentrated along small vertical cracks - probably incorporated from above ash unit.
volcanic clasts – <1% – <1 mm – rounded –
Red to black rounded grains, concentrated along cracks - probably incorporated from above unit. Abundance increases towards upper and lower contacts.
– – – –
Groundmass/Matrix: silt/clay (<0.125 mm) –
Color: 10YR 8/6 pale yellowish orange – **Structures:** unbedded – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: completely (95-100% altered) – clay
Veins:
Fractures:
Additional comments:
Sharp rather than gradational contact with underlying flow unit suggests ash deposit rather than soil horizon.

BOX UNIT 2: aphyric basalt — UNIT #: 42

Contacts: Top (ft): (R 150-3.3-856.3')(depositional)
Bottom (ft): (R150-4.1-857.1')(flow contact)
clay-like rubble/soil at base (poor recovery)
Unit type: massive
pahoehoe ?
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray– **Structures:** – **Sorting:** –
Vesicles: variable – 1-5 mm – – –
Alteration: fresh (<2% altered) –
Veins:
Fractures: weakly fractured
Additional comments:

BOX 103 CONTINUED ON NEXT PAGE



Box #: 103

Cores in box
150
151

Loggers: JCL
Date logged: 11/9/93
Checked by: MG
Check date: 11/11/93

Driller's depth:top [feet]: 858.9
Driller's depth:bottom [feet]: 868.2
Core type: HQ

Units in box: 3

BOX UNIT 3: moderately olivine phyric basalt

UNIT #: 43

Contacts: Top (ft): (R 150-4.1-857.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
soil marks top of unit

Unit type: massive

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-8% – 1-5 mm – blocky (<3:1:1) –
Point count 7/100; red oxidation on smaller grains and along rims of larger grains.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 med. gray– **Structures:** – **Sorting:** –

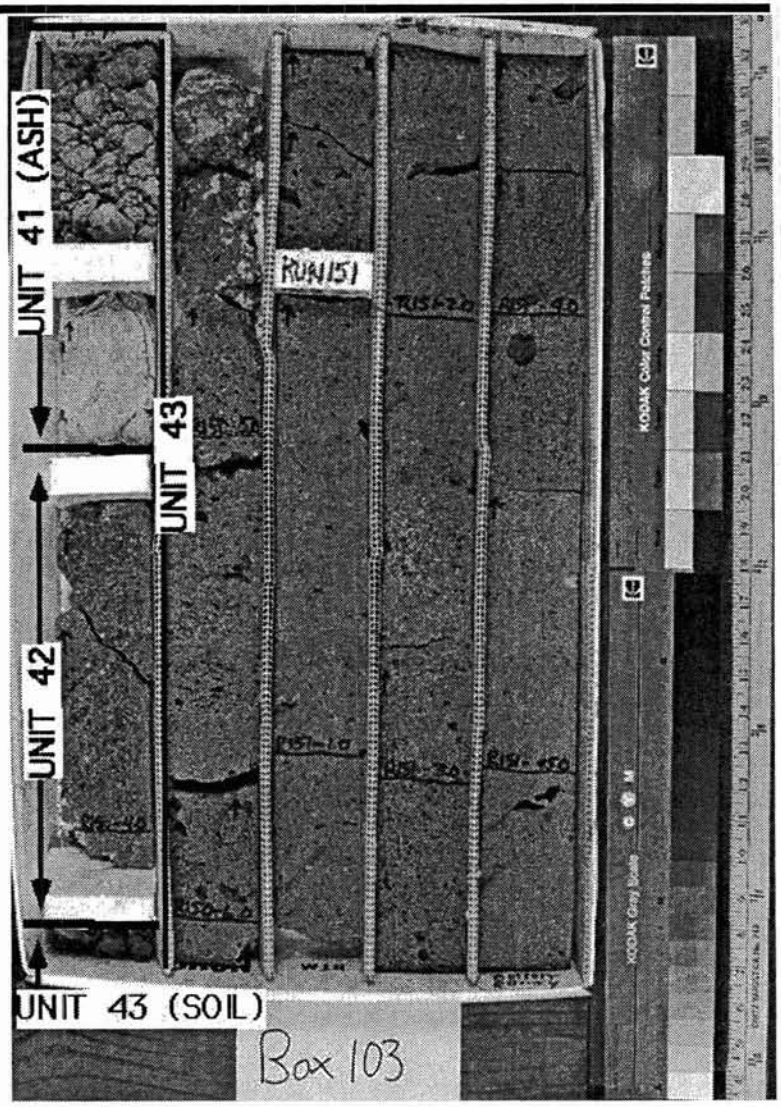
Vesicles: variable – 1-5 mm – spherical – equant–
Content ranges from <5% to 20%. Smaller vesicles are equant to sub-vertically elongate. Larger vesicles are irregular to sub-horizontally elongate. Partial gray to orange-yellow infilling above R150-5.0. Vesicle content decreases to <5% below R151-0.0, with some areas containing more vesicles. Striations present from R150-5.0 to 6.0.

Alteration: fresh (<2% altered) –

Veins:

Fractures: weakly fractured: 9/8 ft

Additional comments:
0.1 ft mud containing rounded basalt clasts from R150-4.1 to 4.2, infilling of vesicles immediately below this point.
J. Lockwood/F. Trusdell comment, 11/19/93: probably a Mauna Loa flow



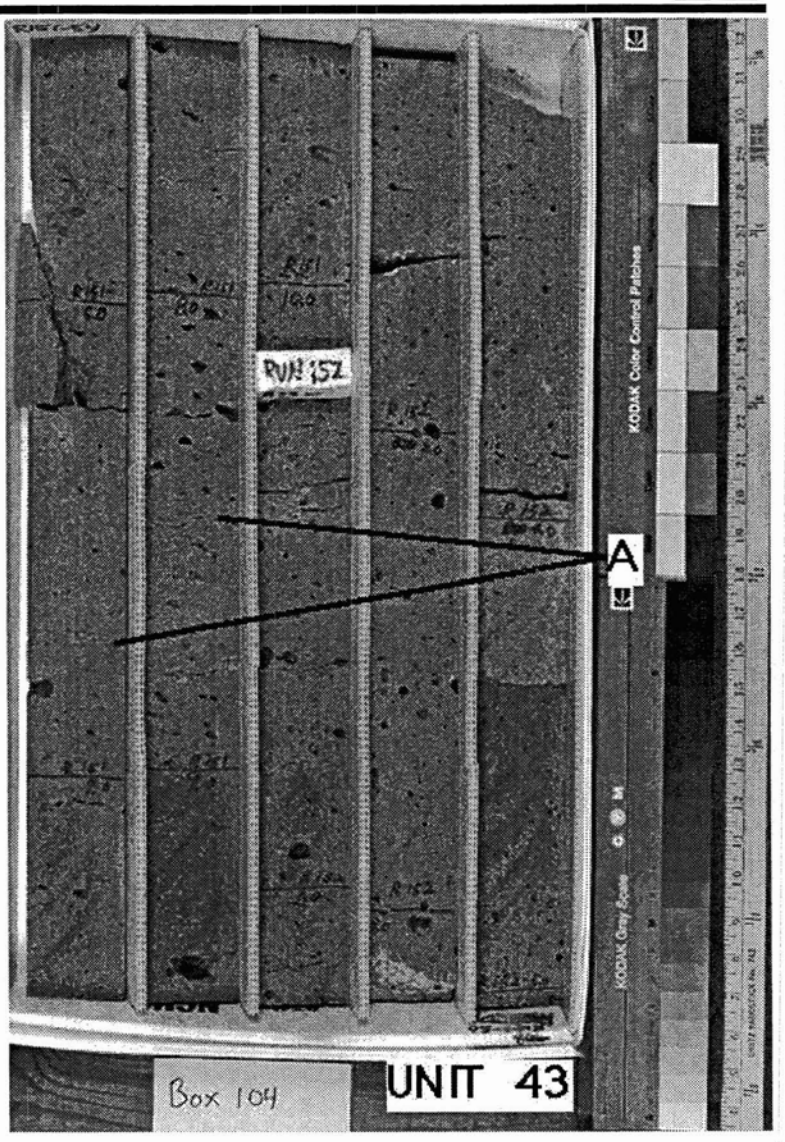
Box #:	Cores in box
104	151 152

Loggers:	MBB
Date logged:	11/9/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	868.2
Driller's depth:bottom [feet]:	878.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:43**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 2-4 mm – equant to blocky –
Point counts: 5% at R151-7.4; 6% at R152-0.8. Olivines contain spinel inclusions. Minor oxidation - some olivines have iridescent coating (MnO?).
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N6 medium light gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – >5 mm – sub-rounded – equant to elongate –
Also present are subhorizontal strings of highly elongate vesicles - see "A" on photo; bimodal (<1 mm and >5 mm).
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 7/9.8 ft
Additional comments:



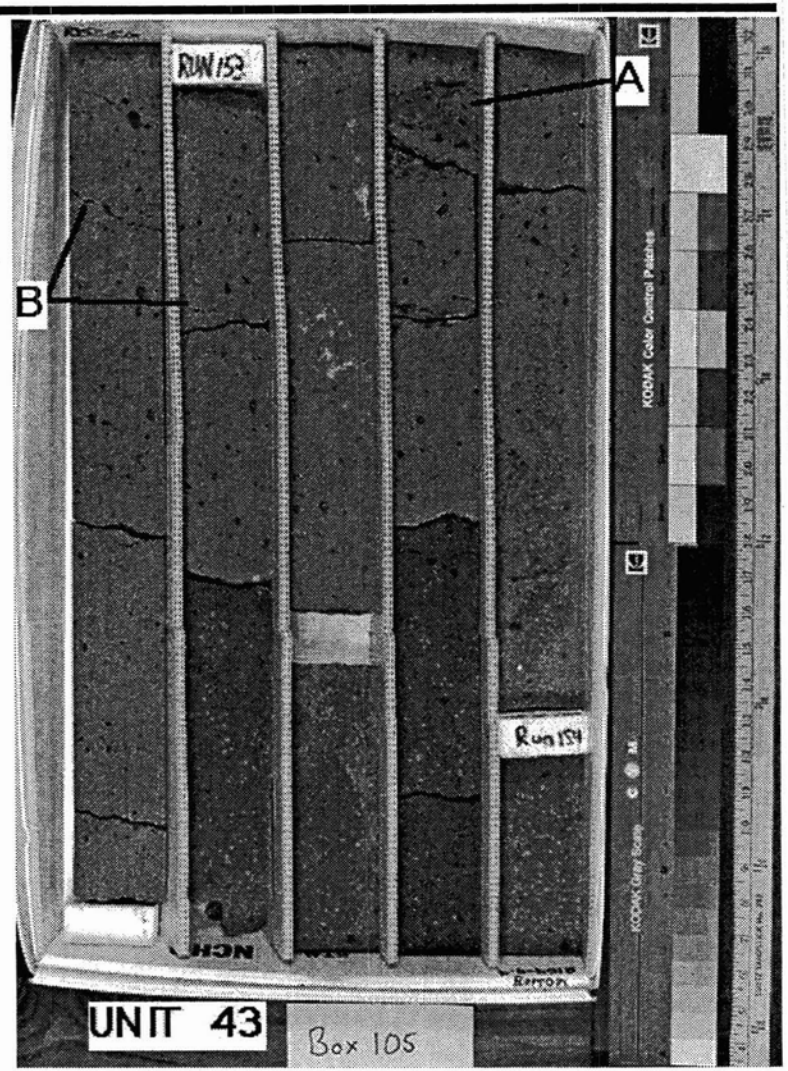
Box #:	Cores in box
105	152 153 154

Loggers:	MBB
Date logged:	11/9/93
Checked by:	MG
Check date:	11/11/93

Driller's depth:top [feet]:	878.5
Driller's depth:bottom [feet]:	887.8
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:43**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 2-4 mm – equant to tabular –
9% at R153-2.4. Spinel inclusions within olivine phenocrysts; olivines occur in crystal clots.
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – rounded to subrounded – equant–
Note subhorizontal vesicle trains at "B" (see photo). Yellowish-orange coating on surfaces of vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 11/9.4 ft
Additional comments:
NaCl ppt. "A" = horizontal fine-grained segregation vein - lacks olivine phenocrysts; the groundmass contains abundant plagioclase laths.



Box #: 106

Cores in box
154
155

Loggers: JCL
Date logged: 11/9/93
Checked by: MG
Check date: 11/11/93

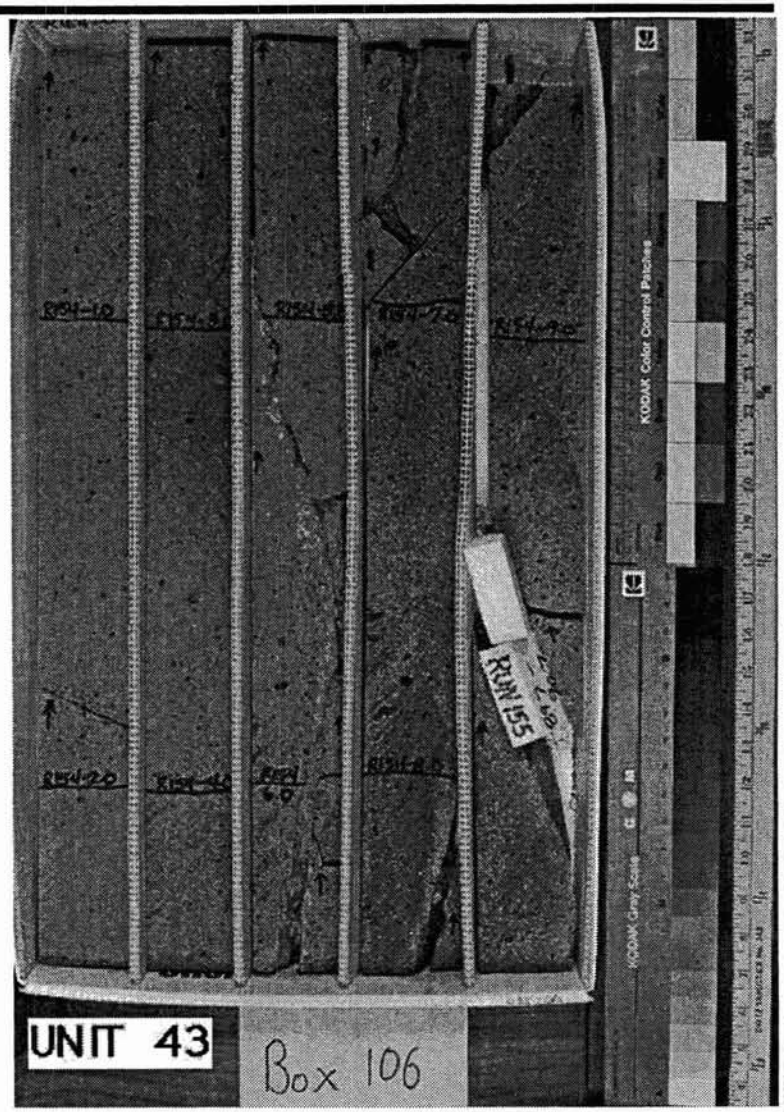
Driller's depth:top [feet]: 887.8
Driller's depth:bottom [feet]: 897.7
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:43

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 7-9% – 1-2 mm – blocky (<3:1:1) –
Point count at R154-2.0. Fresh above R154-5.5, becoming redder below this depth.
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – rounded – see below–
Equant to vertically elongate above R154-5.5; equant to horizontally elongate below R154-5.5.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 12/10 ft; red clay(?)/oxidation rinds on surfaces.
Additional comments:
rare gabbroic open-textured inclusions



Box #: 107

Cores in box
155
156

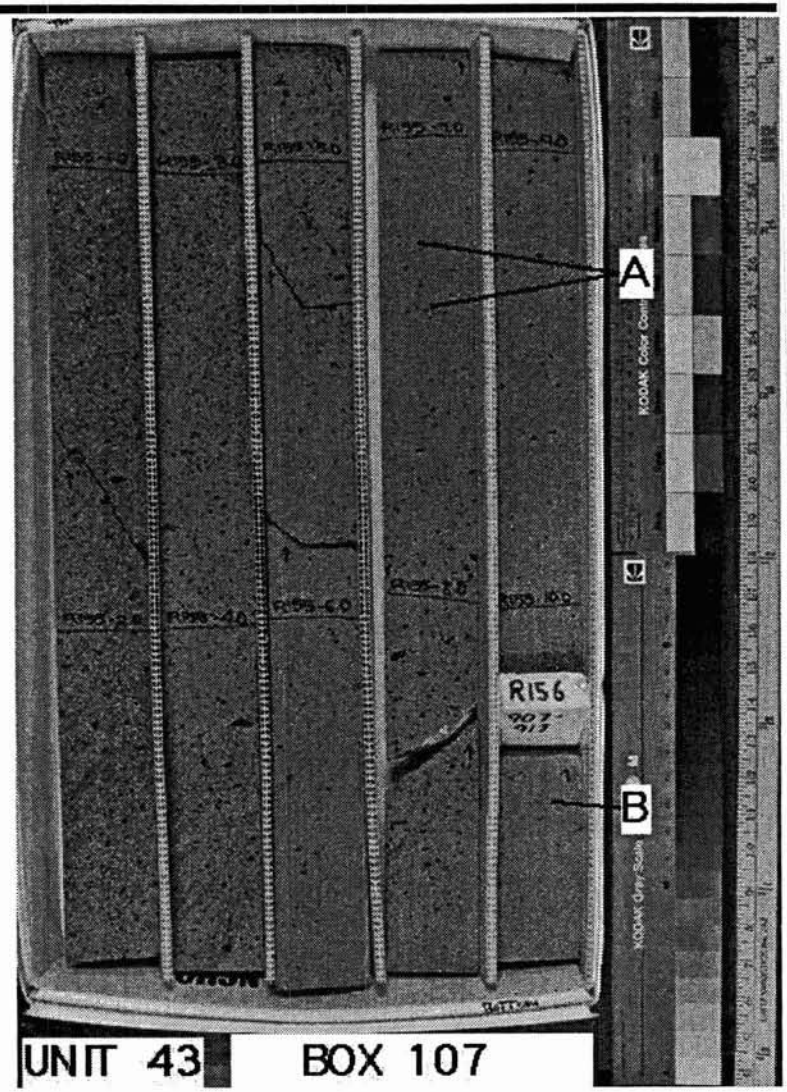
Loggers: JCL
Date logged: 11/10/93
Checked by: MG
Check date: 11/12/93

Driller's depth:top [feet]: 897.7
Driller's depth:bottom [feet]: 907.5
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:43**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-7% – 2-4 mm – blocky (<3:1:1) –
Point count at R155-6.0. Small spinel inclusions. Altered red above R155-5.0, becoming mostly green below this depth.
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 2-5% – 1-5 mm – rounded – equant to horizontally elongated –
A=sub-horizontal vesicle train. B=60° vesicle train
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 5/10 ft. Some fresh fractures, some with yellowish-white coating.
Additional comments:



Box #: 108

Cores in box
156
157

Loggers: JCL
Date logged: 11/10/93
Checked by: MG
Check date: 11/12/93

Driller's depth:top [feet]: 907.5
Driller's depth:bottom [feet]: 921.7
Core type: HQ

Units in box: 3

BOX UNIT 1: moderately olivine phyric basalt

UNIT #: 43

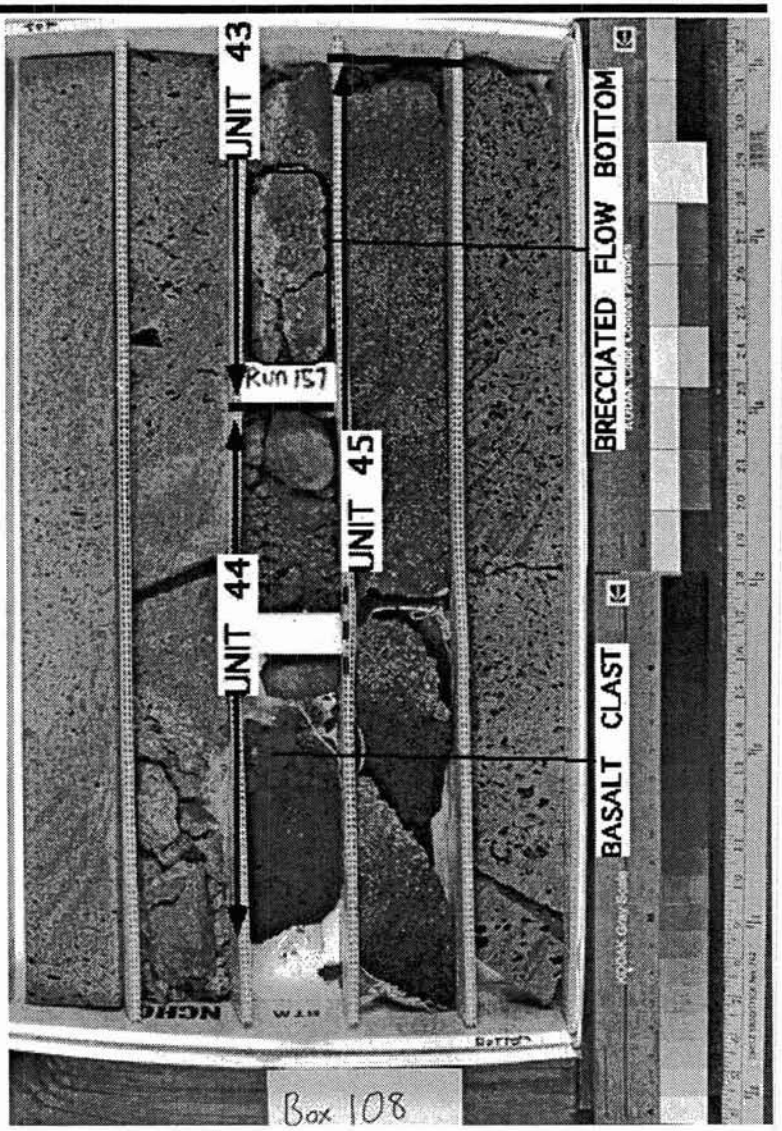
Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R157-0.0-917.0')(flow contact)
rubble at base overlying a reddish soil
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-8% – 2-4 mm – blocky (<3:1:1) –
Point count at R156-2.0.
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5-20% – 1-4 mm – rounded to sub-rounded – equant to horizontally elongated –
3% point count at R156-1.0, 11% at R156-3.0. Vesicles get larger and more abundant till R156-3.2, then smaller, concentrated in sub-horizontal bands and partially infilled with reddish brown material below this depth.
Alteration: fresh (<2% altered) –
becomes rubbly and more highly altered (some clay) near base
Veins: none
Fractures: Weakly fractured above R156-4.0.
Additional comments:
Missing about 9.5 ft from runs 156 and 157, combined. Base of flow from R156-4.6 to R157-0.0 is a brecciated, highly altered zone containing vesicular basalt clasts.

BOX UNIT 2: clay-rich soil

UNIT #: 44

Contacts: Top (ft): (R 157-0.0-917.0')(flow contact)
Bottom (ft): (R157-1.0-918.0')(weathering profile)
Unit type: soil
Phenocrysts/Clasts:
–
volcanic clasts – <1% – >5 mm – rounded –
a very few vesicular basalt clasts, similar in vesicle content to top of underlying flow
olivine – <1% – <1 mm – rounded –
green to red olivine grains, variably altered, increasingly abundant towards lower contact
– – – –
Groundmass/Matrix: silt/clay –
Color: 5YR 4/4 moderate brown – **Structures:** unbedded – **Sorting:** well-sorted –
Vesicles: – – – –
Alteration: completely (95-100% altered) –
Veins:
Fractures:
Additional comments:

BOX 108 CONTINUED ON NEXT PAGE



Box #:	Cores in box
108	156 157

Loggers:	JCL
Date logged:	11/10/93
Checked by:	MG
Check date:	11/12/93

Driller's depth:top [feet]:	907.5
Driller's depth:bottom [feet]:	921.7
Core type:	HQ
Units in box:	3

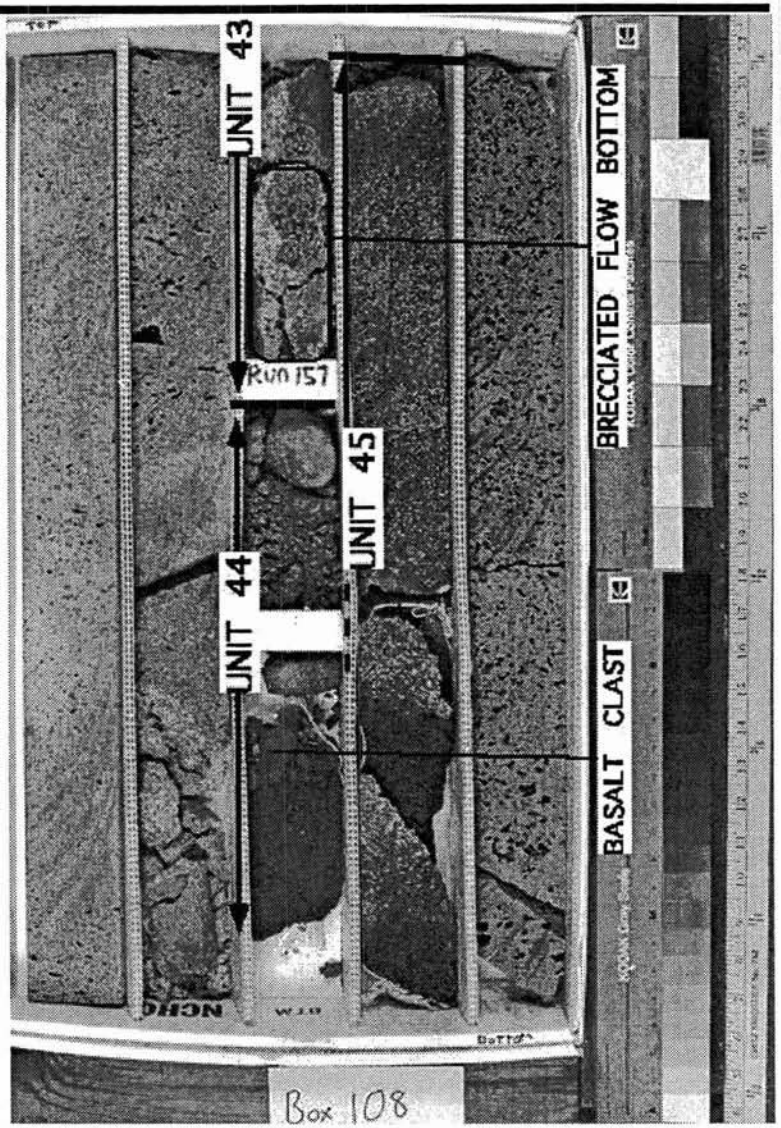
BOX UNIT 3: sparsely to moderately olivine phyric basalt **UNIT #: 45**

Contacts: Top (ft): (R 157-1.0-918.0')(soil horizon)
Bottom (ft): (R--')(continuous with next)

Unit type: pahoehoe
based on highly vesicular zone at top of flow just below soil

Phenocrysts/Clasts:
sparsely to moderately phyric (1-10%) – phenocryst abundance is highly variable
olivine – 1-5% – 1-3 mm – blocky (<3:1:1) –
Highly vesicular zone near top contact has 5% 1-4 mm olivines. The more massive zone below R157-2.5 contains about 1% sub-mm olivines, with olivine content increasing with depth again into next box. Olivine settling apparently has been important in this flow.
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – – –
25% 1-2 mm spherical vesicles at R157-1.0. Vesicles become larger and sub-horizontally elongate below R157-2.5
Alteration: fresh (<2% altered) –
except at top of flow where vesicles are filled with clay-like material
Veins: none
Fractures: weakly fractured: 6/4 ft
Additional comments:
J. Lockwood/F. Trusdell comment, 11/19/93: definite Mauna Kea flow



Box #:	Cores in box
109	157 158

Loggers:	MBB
Date logged:	11/10/93
Checked by:	MG
Check date:	11/12/93

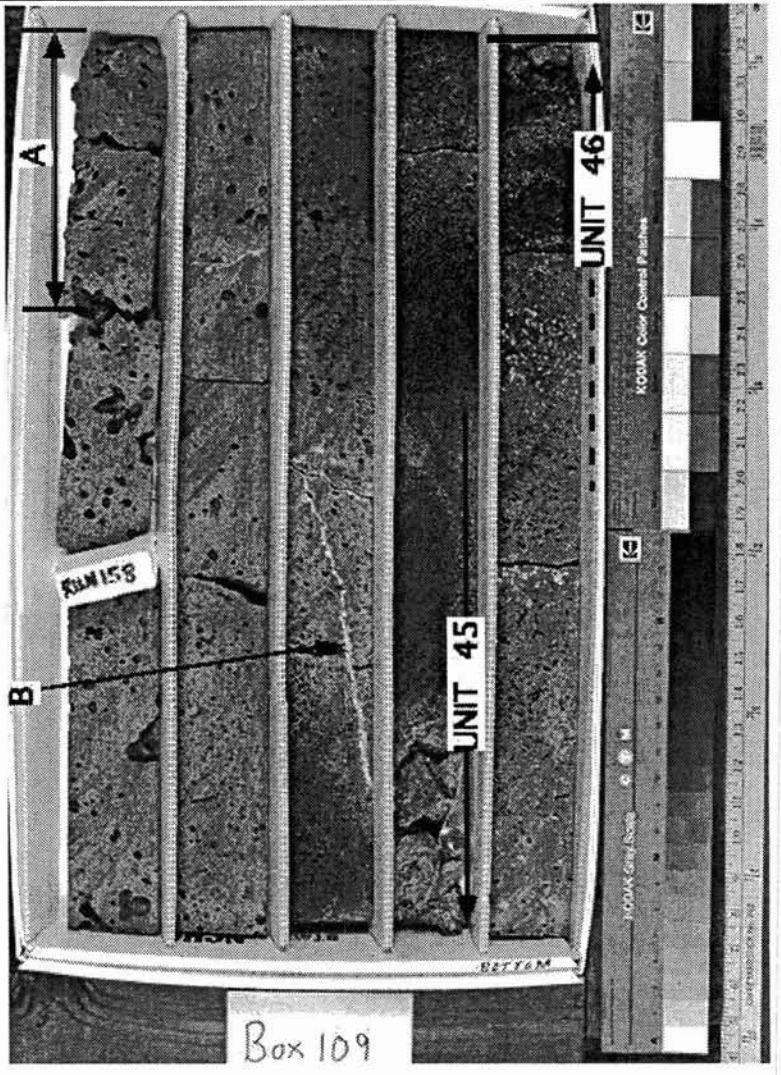
Driller's depth:top [feet]:	921.7
Driller's depth:bottom [feet]:	935.7
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately to highly olivine phyric basalt — UNIT #: 45

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R158-6.6-929.4')(flow contact)
Flow contact defined by abundant ≤1 mm vesicles, ropy flow surface textures and increased weathering/oxidation
Unit type: massive/transitional
Phenocrysts/Clasts:
moderately to highly phyric (2->10%) –
olivine – 2->10% – 1-5 mm – equant –
Olivine volume% is quite variable: ≤3% at R157-5.4; 14% at R158-2.2; 5% at R158-6.0. Near bottom contact olivines have an iridescent (MnO?) coating.
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-30% – 1-10 mm – rounded to subrounded – equant to elongate –
Vesicle size and volume% varies dramatically within section - see photo. Size decreases and volume% increases toward bottom contact. "A" (see photo) = region of large vugs with Fe-oxide coatings. At R158-3.5 flattened horizontal vesicles form vesicle trains. Near contact, vesicles are filled with clay(?).
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 10/6 ft. Fractures have pale-yellow coatings (clay? - see region marked "B" on photo).
Additional comments:

BOX UNIT 2: aphyric basalt — UNIT #: 46

Contacts: Top (ft): (R 158-6.6-929.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
For discussion of flow contact, see comments for unit 1
Unit type: massive/transitional
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-3 mm – equant to blocky –
Iridescent coating (MnO?) and some iddingsite alteration
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-50% – 1-10 mm – rounded to subrounded – equant –
Vesicle size increases and volume% decreases down section, away from contact.
Alteration: fresh (<2% altered) –
Veins:
Fractures: Weakly fractured; fractures have white/yellow clay(?) coating.
Additional comments:



Box #: 110

Cores in box
158
159

Loggers: JCL
Date logged: 11/10/93
Checked by: MG
Check date: 11/12/93

Driller's depth:top [feet]: 935.7
Driller's depth:bottom [feet]: 944.3
Core type: HQ

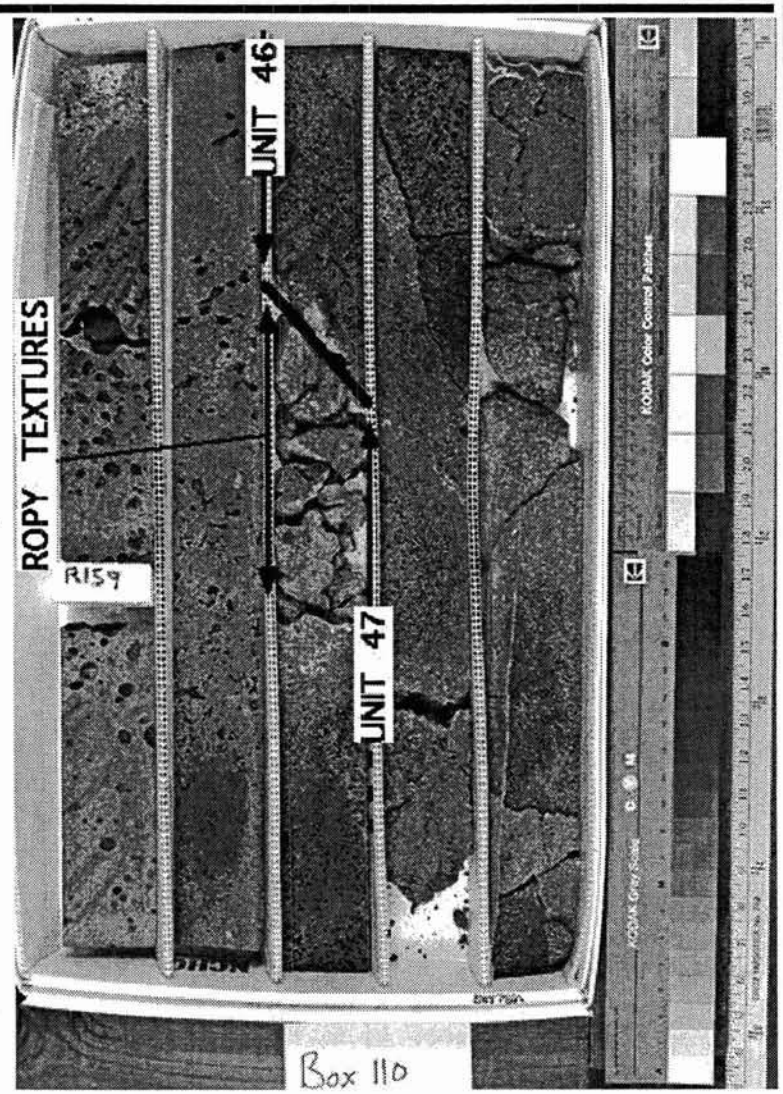
Units in box: 2

BOX UNIT 1: sparsely to moderately olivine phyric basalt — UNIT #: 46

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 159-3.5-936.1')(flow contact)
Probable flow boundary based on increase in vesicularity and rubble zone with "ropy" surface flow features, but no distinct lithology change.
Unit type: massive
Phenocrysts/Clasts:
sparsely to moderately phyric (1-10%) –
olivine – 1-5% – 1-5 mm – blocky (<3:1:1) –
Point count at R159-0.5=1%. Point count at R159-2.0=5%. Olivine settling. Olivines get larger and more abundant with depth
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 5-10 mm – rounded – equant to sub-vertically elongated –
28% large (5-10 mm) vesicles at R158-9.5. Vesicles get smaller and more abundant with depth. (5-10%) Small plagioclase laths visible in vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 4/4 ft
Additional comments:
Yellow-brown coating on rubble from lower contact.

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 47

Contacts: Top (ft): (R 159-3.5-936.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
ropy upper contact
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-5 mm – blocky (<3:1:1) –
iddingsitized along rims
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – rounded – equant to sub-vertically elongated –
26% point count at R159-4.5
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Moderately to weakly fractured. White to yellow-brown coating.
Additional comments:



Box #:	Cores in box
111	159 160

Loggers:	MBB
Date logged:	11/11/93
Checked by:	MG
Check date:	11/12/93

Driller's depth:top [feet]:	944.3
Driller's depth:bottom [feet]:	954.9
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric to moderately olivine phyric basalt **UNIT #:47**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Two possible internal flow contacts at R160-1.0 and at R160-3.0; defined by an increase in vesicle volume% and a decrease in size.

Unit type: massive

Phenocrysts/Clasts:
aphyric to moderately phyric (<1-10%) –
olivine – <1-7% – 2-3 mm – equant to blocky –
Olivine volume% is variable: <1% between R159-8.5 and 9.8 and at R160-1.0; 5% at R160-5.5; 7% at R160-6.7. Olivines display a blackish-blue iridescent coating (MnO?) and minor iddingsite alteration.
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

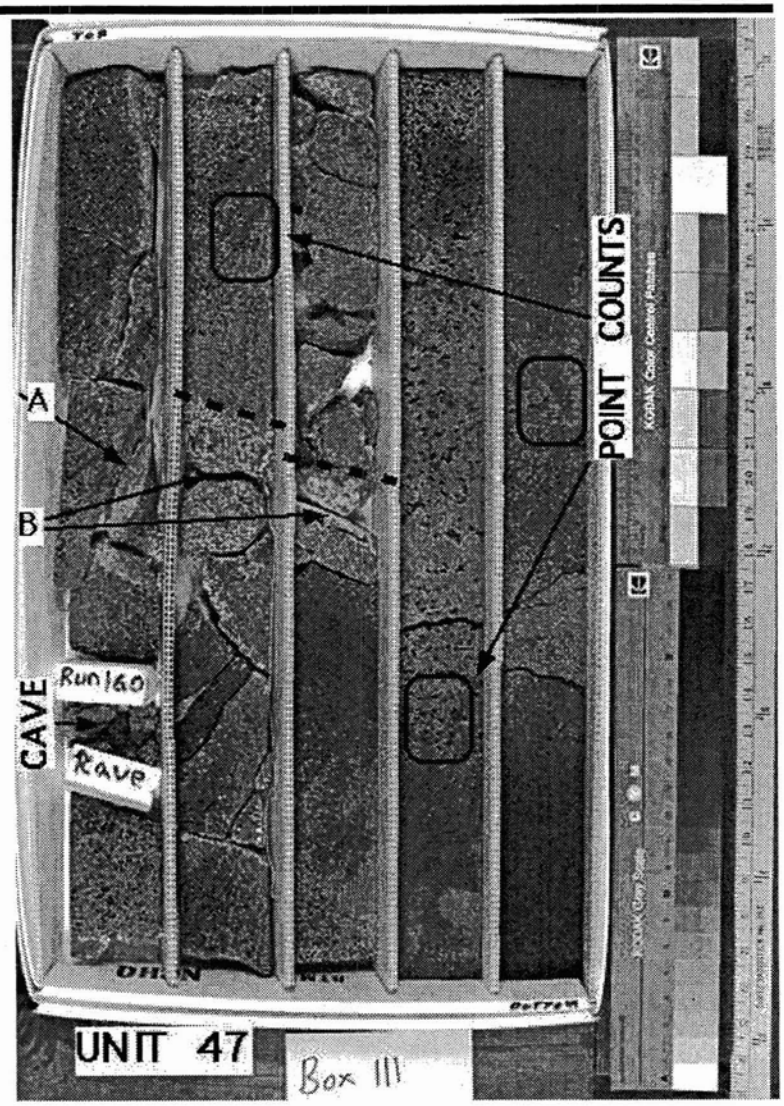
Vesicles: 10-40% – variable – rounded to subrounded – equant to elongate–
Vesicle size and volume% is quite variable, see photo. In more highly fractured regions ("B" in photo), vesicles are filled with white/yellow clay (?).

Alteration: fresh to slightly (<2-10% altered) –
reddish tint to groundmass (weak oxidation)

Veins: none

Fractures: Weakly to moderately fractured; brownish Fe-oxide coating on some fractures (see "A" on photo).

Additional comments:
Cave material has ropy surface textures, however material above and below does not have any of the characteristics of a flow boundary.



Box #: 112

Cores in box
161
162

Loggers: MBB
Date logged: 11/11/93
Checked by: MG
Check date: 11/12/93

Driller's depth:top [feet]: 954.9
Driller's depth:bottom [feet]: 967.5
Core type: HQ
Units in box: 3

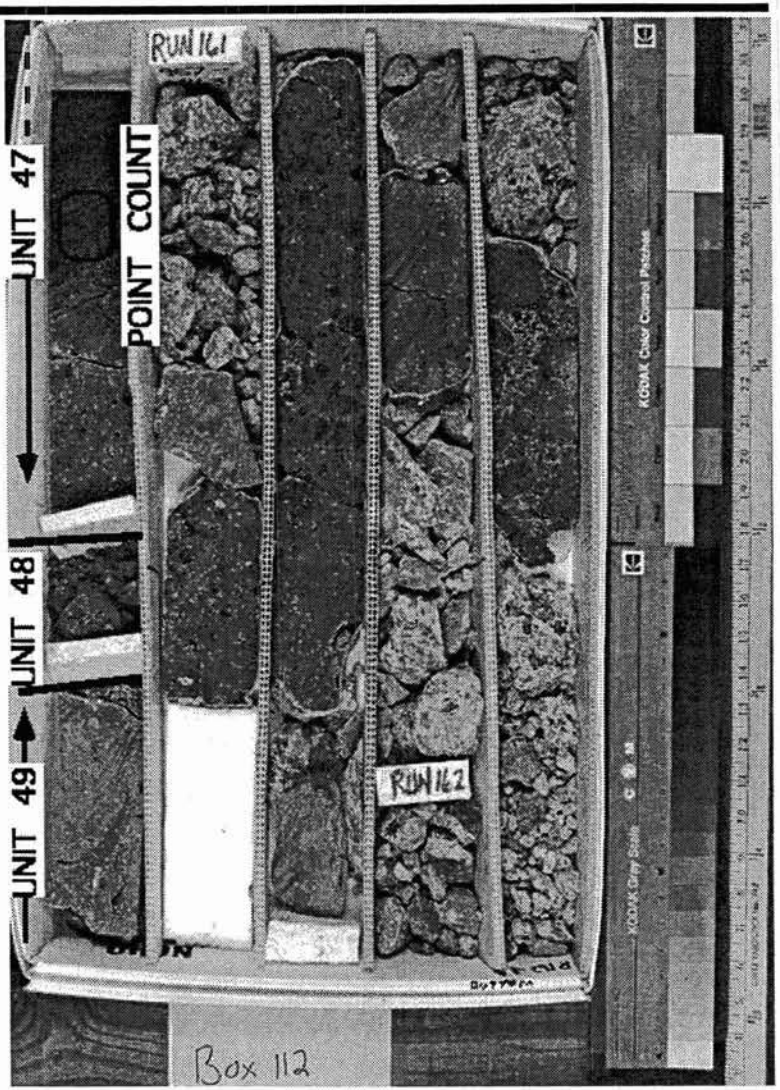
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 47

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R160-8.9-951.4')(flow contact)
Bottom flow contact defined by 0.2 ft weathered ash(?) layer; material is now all clay.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 16% – ~2 mm – equant –
16% at R160-8.2; rare spinel inclusions in the olivines; olivines are present as crystal clots. Alteration consists of minor iddingsite and blackish/blue iridescent coatings on some grains.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – rounded – equant –
Near contact the volume% increases to >30% and the vesicles are often filled with white/yellow clay (?).
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 2/1 ft; yellowish clay on fracture surfaces.
Additional comments:

BOX UNIT 2: weathered ash(?) — UNIT #: 48

Contacts: Top (ft): (R 160-8.9-951.4')(flow contact)
Bottom (ft): (R160-9.1-951.6')(depositional)
Unit type: ash(?)
Phenocrysts/Clasts:
<10% clasts –
– – – –
– – – –
– – – –
Groundmass/Matrix: silt/clay sized material –
Color: 5YR 5/6 light brown – **Structures:** unbedded – **Sorting:** –
Vesicles: none – – – –
Alteration: completely (95-100% altered) – clay
Veins: none
Fractures: none
Additional comments:
Rounded volcanic clasts; high content clay material (ash?)

BOX 112 CONTINUED ON NEXT PAGE



Box #:	Cores in box
112	161 162

Loggers:	MBB
Date logged:	11/11/93
Checked by:	MG
Check date:	11/12/93

Driller's depth:top [feet]:	954.9
Driller's depth:bottom [feet]:	967.5
Core type:	HQ
Units in box:	3

BOX UNIT 3: moderately olivine-plagioclase phyric basalt **UNIT #: 49**

Contacts: Top (ft): (R 160-9.1-951.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Flow contact defined by highly weathered ash(?) unit (see description of unit 2).

Unit type: aa to massive
weathered rubbly zone (see photo) = aa flow top (see additional comments).

Phenocrysts/Clasts:
moderately phyric (2-10%) –
plagioclase – 2% – ~3 mm – tabular to lath-shaped – sericite(?)
2% at R160-9.3. Most of the plagioclase phenocrysts have a milky-white color.
olivine – <1% – 1-2 mm – blocky (<3:1:1) –
minor iddingsite on rims

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray– **Structures:** – **Sorting:** –

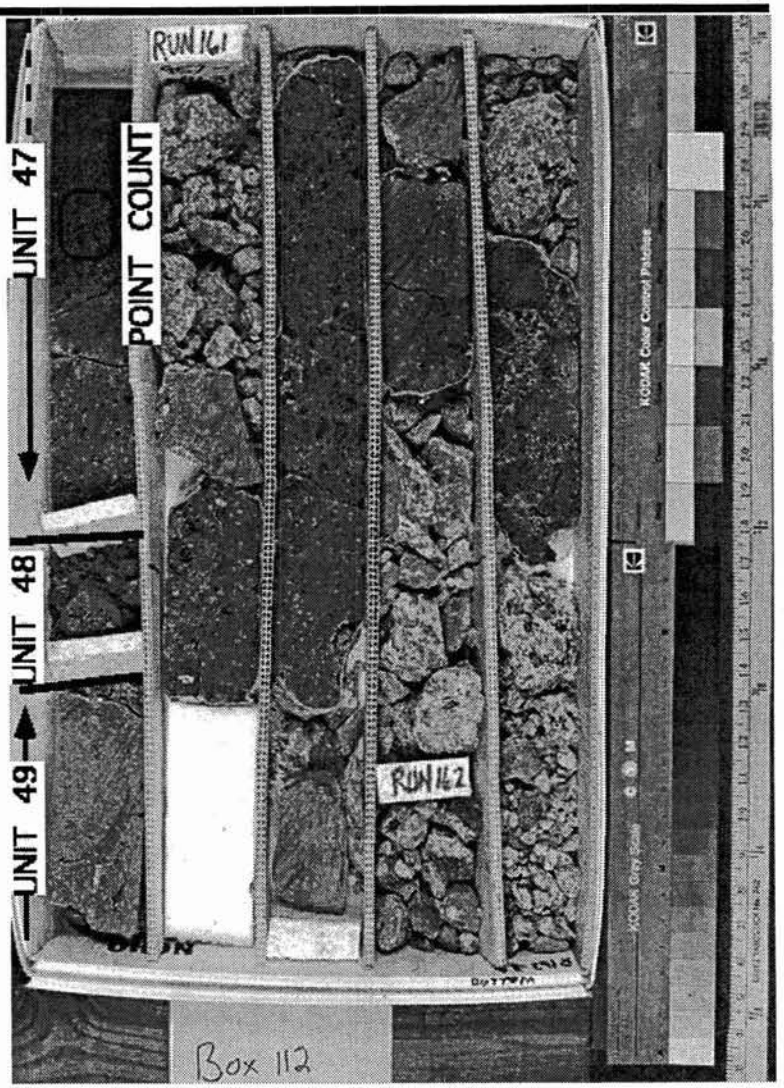
Vesicles: <5% – <5 mm – sub-angular – elongate - no preferred orientation–
clay

Alteration: moderately (10-40% altered) –
groundmass has a brownish tint (oxidation?) and incipient clay formation

Veins:

Fractures: Moderately to highly fractured; highly fractured regions are essentially rubble zones (see photo).

Additional comments:
Subrounded to subangular clasts (1-5 mm) in diameter set in a more weathered/oxidized matrix of the same material. Plagioclase phenocrysts with similar morphologies are present in both the clasts and the matrix. The subrounded clasts may reflect the action of a stream flowing over the top of the aa flow.



Box #:	Cores in box
113	162 163

Loggers:	MBB
Date logged:	11/11/93
Checked by:	MG
Check date:	11/12/93

Driller's depth:top [feet]:	967.5
Driller's depth:bottom [feet]:	976.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine-plagioclase phyric basalt **UNIT #:49**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa to massive
In the region R162-1.8 to R162-5.3 subrounded to subangular clasts in a more altered (clay?) matrix grades into massive material by R163-5.5. Transition zone consists of less oxidized and weathered matrix material.

Phenocrysts/Clasts:
moderately phyric (2-10%) –
plagioclase – – 2-8 mm longest dimension – tabular to lath-shaped –
Some larger grains display a sieve-texture. Many grains are altered to a milky-white colored material
olivine – <1% – 1-2 mm – equant –
Olivines are almost completely altered to iddingsite.
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray; massive unoxidized zone – **Structures:** – **Sorting:** –

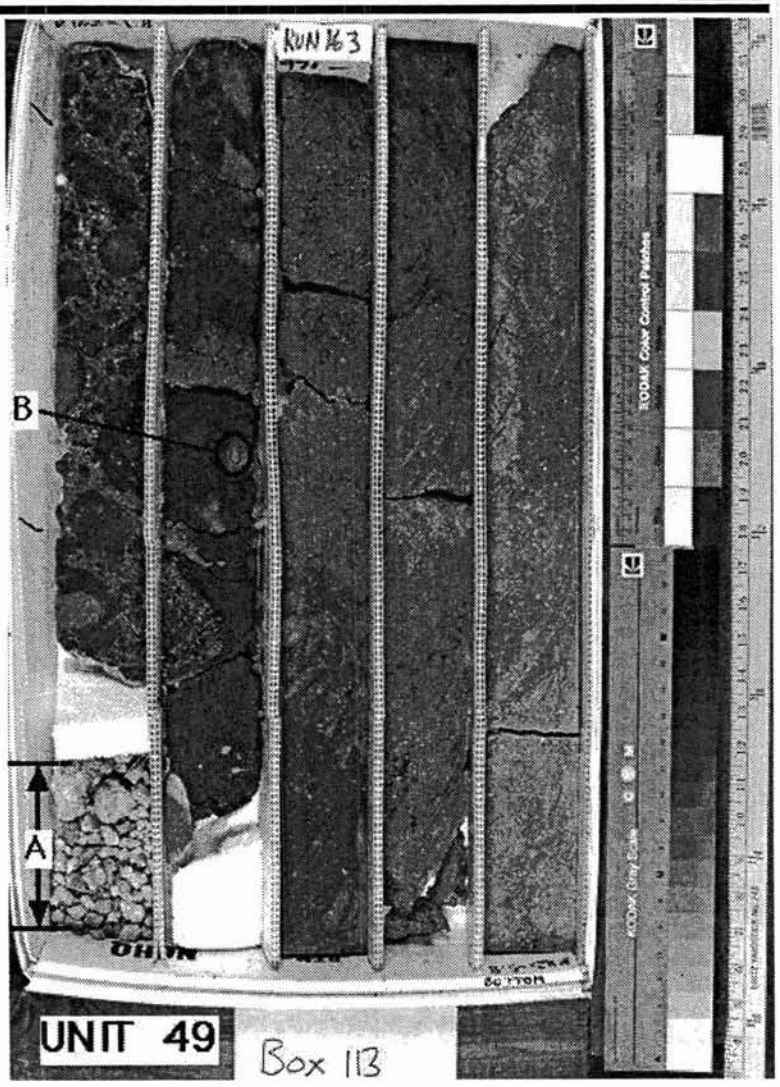
Vesicles: <5% – 1-5 mm – subrounded to subangular – equant to elongate –
equant vesicles are only present in the clasts

Alteration: highly (40-80% altered) to fresh (<2% altered) at bottom of box –
alteration consists of oxidized material and clay

Veins: none

Fractures: weakly fractured

Additional comments:
see photo: "A" = zone of clasts where the matrix has been washed away. "B" = inclusion of plagioclase-rich basalt (?).



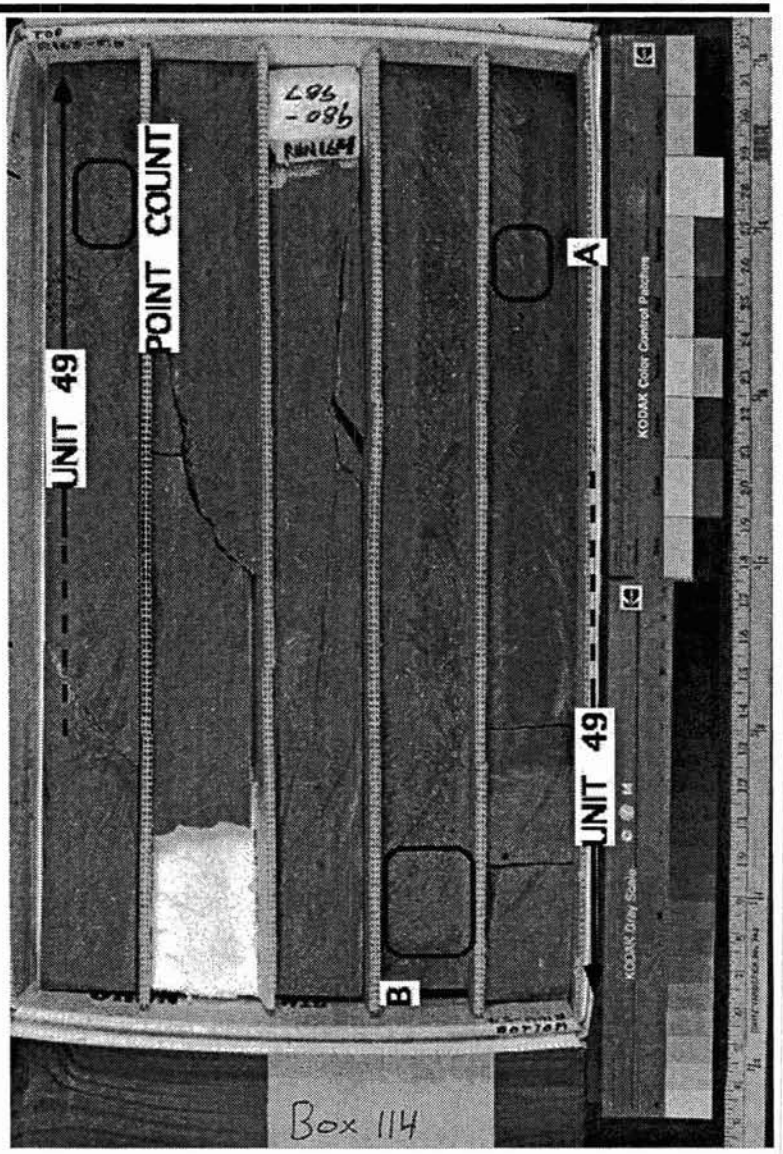
Box #:	Cores in box
114	163 164

Loggers:	MBB
Date logged:	11/11/93
Checked by:	MG
Check date:	11/12/93

Driller's depth:top [feet]:	976.6
Driller's depth:bottom [feet]:	985.3
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine-plagioclase phyric basalt **UNIT #:49**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
plagioclase – 5% – – –
5% at R163-6.0; plagioclase phenocrysts are inhomogeneously distributed
olivine – <1% – 1-2 mm – equant – iddingsite
Olivines are almost completely altered.
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: <5% – <1 mm – sub-angular – elongated–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 7/9.2 ft; reddish-brown (iron-oxide?) and whitish-yellow clay(?) coatings on some fracture surfaces.
Additional comments:
see photo: "A" = 14 mm long sieve-textured plagioclase; other less definitive examples are present in this section. "B" = zone of minor oxidation



Box #:	Cores in box
115	164 165

Loggers:	JCL
Date logged:	11/11/93
Checked by:	MG
Check date:	

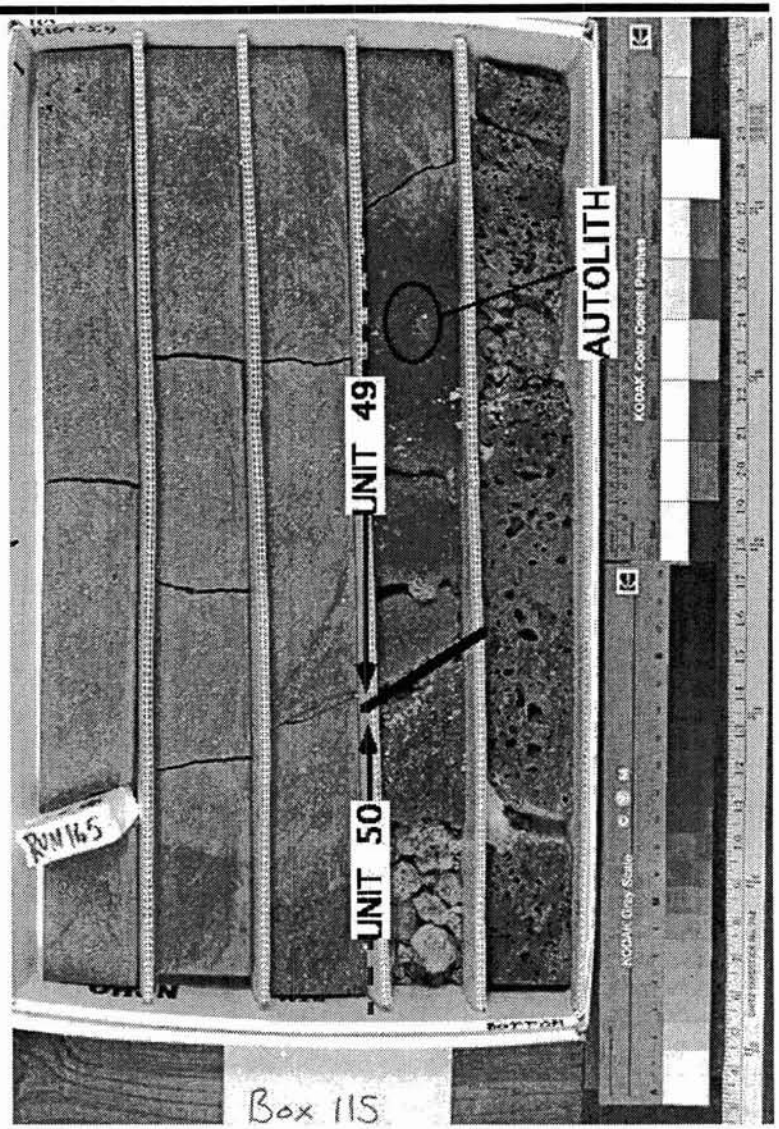
Driller's depth:top [feet]:	985.3
Driller's depth:bottom [feet]:	995.1
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately magnetite-olivine-plagioclase phyric basalt — UNIT #: 49

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R165-5.8-993.6')(flow contact)
Unit type: massive grading to aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
plagioclase – 2-4% – 1-3 mm – tabular (>3:1:1) –
olivine – <1% – 1-5 mm – blocky to equant –
magnetite – <1% – <1 mm – equant –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-2 mm – sub-rounded – horizontally elongated –
Horizontal striations of micro-vesicles. Occasional autoliths of more vesicular basalt (10% vesicles), especially near lower contact.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured (12/8 ft) above rubbly base
Additional comments:
Rubbly base is oxidized red. Zone of discoloration (groundwater staining?) at R165-2.1 to 2.3.

BOX UNIT 2: aphyric basalt — UNIT #: 50

Contacts: Top (ft): (R 165-5.8-993.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
plagioclase – <1% – 1-2 mm – tabular (>3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: variable – 1-10 mm – rounded – variably elongate –
10% at R165-7.2, increasing to 32% at R165-8.0. Vesicles become smaller and partially infilled with yellowish white soft (clay or zeolite?) material near upper contact.
Alteration: fresh (<2% altered) –
Veins:
Fractures: weakly fractured (4/2 ft), except for some altered rubbly zones
Additional comments:
red to black coating of rubble from R165-6.9



Box #:	Cores in box
116	165 166

Loggers:	MBB
Date logged:	11/11/93
Checked by:	MG
Check date:	

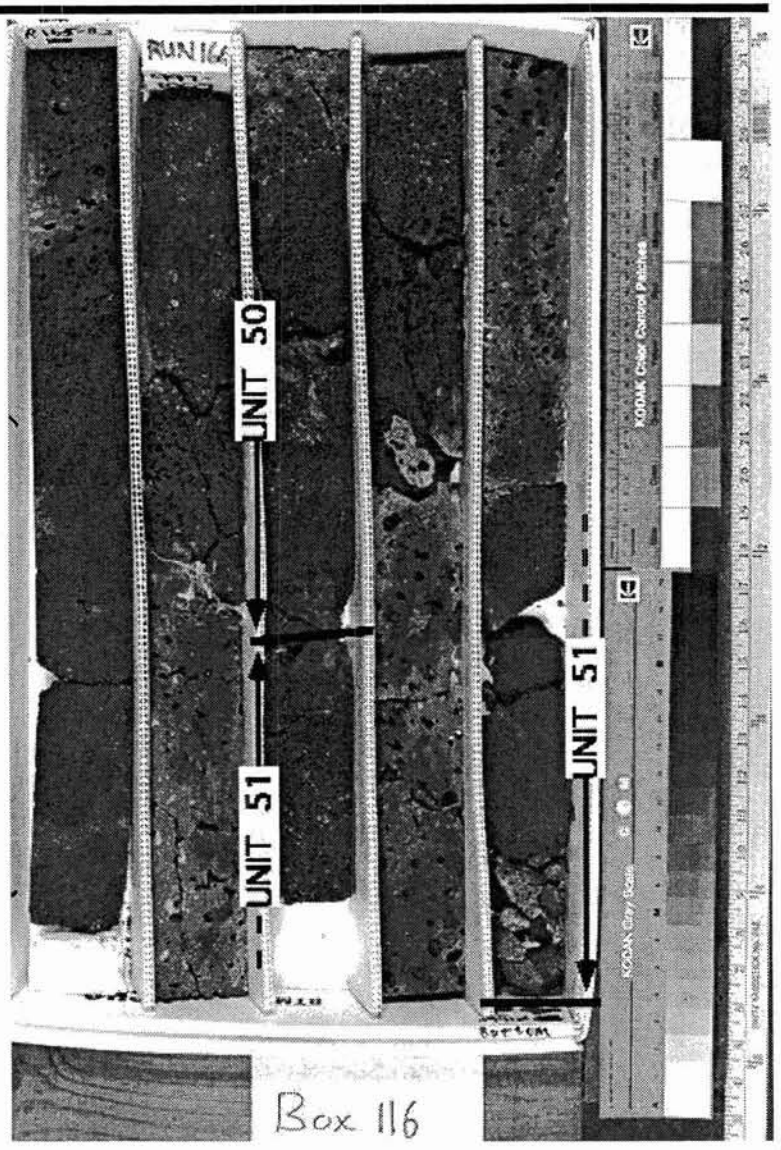
Driller's depth:top [feet]:	995.1
Driller's depth:bottom [feet]:	1004.7
Core type:	HQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 50

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 166-3.1-1001.0')(flow contact)
Flow contact defined by decrease in vesicle size and ropy surface textures, however the lower unit looks lithologically similar, implying that the contact may be an internal one.
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – ≤1 mm – equant –
Olivines are nearly completely altered to iddingsite.
plagioclase – <1% – ≤1 mm – lath-shaped –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: 5-30% – <1 to 10 mm – rounded to subrounded – equant to elongate –
Vesicle size and volume% are quite variable, see photo; vesicles are filled with clay(?) in regions of higher fracture density.
Alteration: moderately (10-40% altered) –
Alteration consists largely of oxidation which is extensive at base and top of unit.
Veins: none
Fractures: weakly fractured: 11/4.9 ft
Additional comments:

BOX UNIT 2: aphyric basalt — UNIT #: 51

Contacts: Top (ft): (R 166-3.1-1001.0')(flow contact)
Bottom (ft): (R 166-7.7-1005.6')(flow contact)
Possible lower flow contact defined by oxidized rubbly zone with abundant small vesicles.
Unit type: massive
See unit 1 for a description of this unit - this material is nearly identical to that in unit 1.
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – bimodal – round – equant –
Alteration: slight (10-40% altered) – oxidation
Veins: none
Fractures: weakly: 10/5 ft
Additional comments:



Box #: 117

Cores in box
166
167

Loggers: JCL
Date logged: 11/11/93
Checked by: MG
Check date:

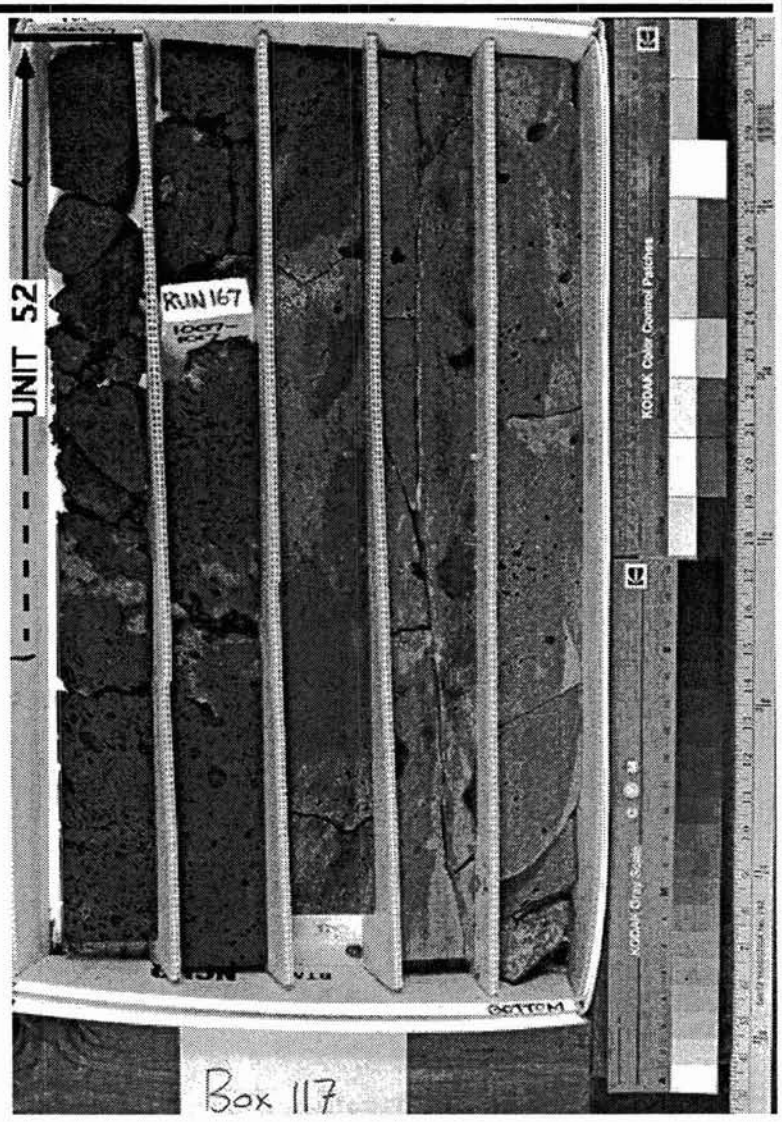
Driller's depth:top [feet]: 1004.7
Driller's depth:bottom [feet]: 1013.8
Core type: HQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:52

Contacts: Top (ft): (R 166-7.7-1005.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Oxidized, vesicular upper zone with some "transitional" breccia, but no distinct lithology change - probable flow boundary.
Unit type: massive
transitional upper contact
Phenocrysts/Clasts:
aphyric (<1%) –
plagioclase – <1% – 4-6 mm – tabular (>3:1:1) – sieve-textured
olivine – <<1% – 1-3 mm – equant –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: >30% – variable – rounded to irregular – –
>30% spherical vesicles near upper contact. 2-8 mm inclined vesicles from R166-8.5 to R167-1.5 (30-40%). Becomes less vesicular with smaller vesicles (<1 mm) below R167-1.5. Vesicles in lower portion concentrated along inclined to sub-horizontal trains and some vertical "pipes". Some larger vesicles also present in lower portion of flow.
Alteration: fresh (<2% altered) –
red oxidized flow top becoming fresher with depth
Veins:
Fractures:
Additional comments:



Box #: 118

Cores in box
167
168

Loggers: JCL
Date logged: 11/11/93
Checked by: MG
Check date:

Driller's depth:top [feet]: 1013.8
Driller's depth:bottom [feet]: 1023.4
Core type: HQ

Units in box: 2

BOX UNIT 1: aphyric basalt

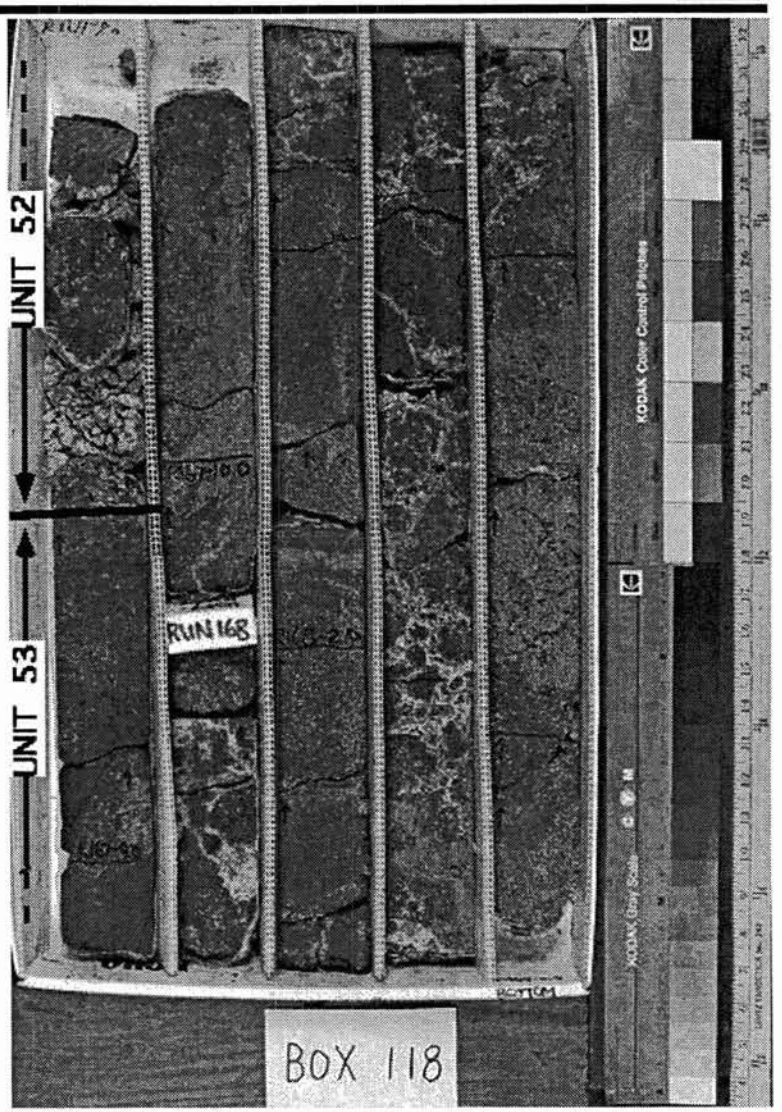
UNIT #: 52

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 167-8.0-1016.2')(flow contact)
Unit type: aa
highly brecciated
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: >30% – <1 mm – rounded – equant –
Alteration: moderately (10-40% altered) –
infilling between breccia with soft brownish-yellow clay(?)
Veins: none
Fractures: rubble
Additional comments:

BOX UNIT 2: aphyric basalt

UNIT #: 53

Contacts: Top (ft): (R 167-8.0-1016.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – blocky (<3:1:1) –
mostly highly altered - red to black in color
– – – –
– – – –
Groundmass/Matrix: microcrystalline clasts in clay matrix –
Color: see below– **Structures:** – **Sorting:** –
Vesicles: 10-30% – 1-2 mm – subrounded to irregular – variably elongated –
soft yellow infilling in brecciated portion of flow
Alteration: moderately to completely (10-100% altered) –
Decreases with depth. Red clay horizon grading to less altered basalt clasts. Infilling of fractures and vesicles with soft yellow material.
Veins:
Fractures: Weakly to moderately fractured - subhorizontal sets.
Additional comments:
Color grades from moderate reddish brown (10R 4/6) at upper contact to dark gray (N4) at base. Recognizable autoliths become more abundant with depth.
J. Lockwood comment, 11/19/93 (re material at top of unit 53, identified by some observers as "stream gravel"): "typical surface caliche", perhaps indicating this flow top was at the surface for an extended time; looks like things on Kohala and at Puoko-Kawahi road cut on Mauna Kea.



Box #:	Cores in box
119	168 169

Loggers:	MBB
Date logged:	11/11/93
Checked by:	MG
Check date:	

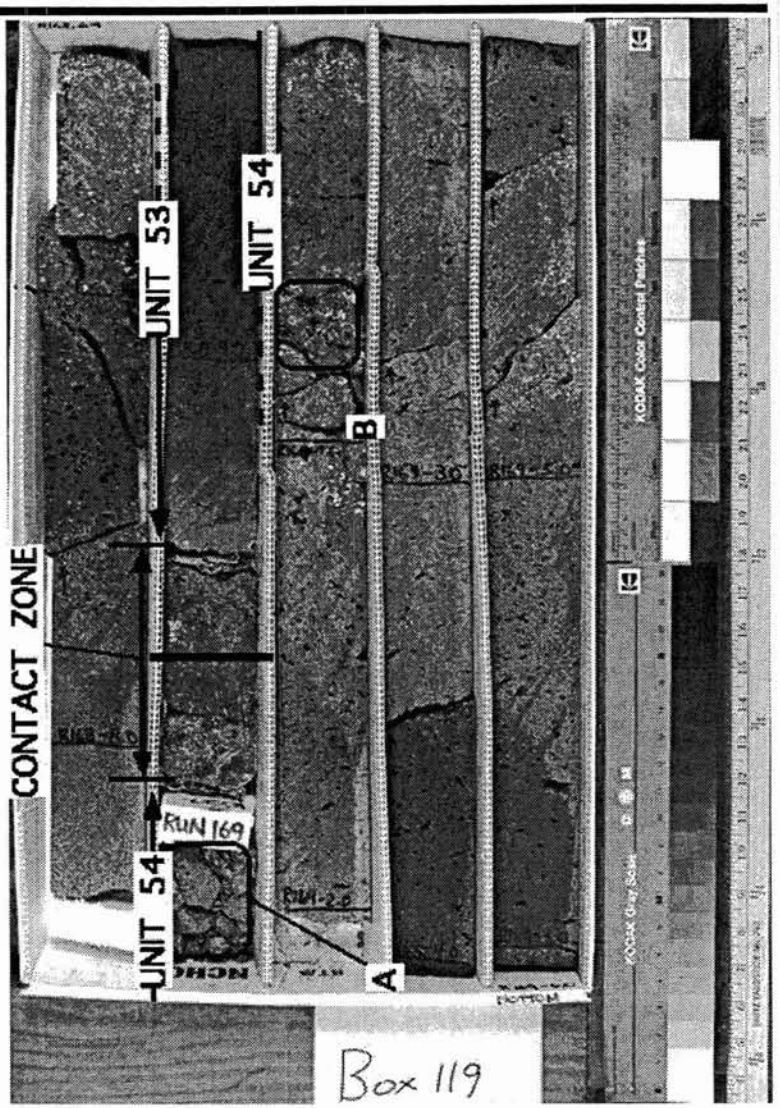
Driller's depth:top [feet]:	1023.4
Driller's depth:bottom [feet]:	1033.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 53

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 168-9.6-1028.1')(flow contact)
Flow contact occurs within weathered zone labeled "CONTACT ZONE" on the photo (R168-9.3 to end of run).
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – – 1-2 mm – equant to tabular –
2-4% at R168-8.0; minor iddingsite alteration of the olivine rims.
plagioclase – <<1% – <1 mm – lath-shaped –
very rare plagioclase
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: – **Structures:** – **Sorting:** –
Vesicles: 10-20% – – subrounded to subangular – equant to horizontally elongate –
Vesicle size and volume% are quite variable, see photo; at R168-6.4 vesicles are filled with fine-grained white material.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 5/2.9 ft; fracture surfaces are oxidized and clay (?) coatings
Additional comments:

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 54

Contacts: Top (ft): (R 168-9.6-1028.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Flow contact defined by zone of weathering and oxidation that grades into massive material lower in section.
Unit type: massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 2-4 mm – equant –
<1% and 2% at R169-3.0; no spinel inclusions observed; minor iddingsite alteration along rims
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 medium light gray – **Structures:** – **Sorting:** –
Vesicles: 10-30% – 1-10 mm – subrounded to subangular – elongate –
small (≤1 mm) vesicles are generally equant
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 9/5.9 ft; white clay (?) coatings on fracture surfaces.
Additional comments:
see photo: "A" = possible cave material. "B" = zone of oxidation and incipient clay formation.
J. Lockwood comment, 11/19/93: "Mauna Kea rocks" based on fine-grained matrix



Box #: 120

Cores in box
169
170

Loggers: JCL
Date logged: 11/11/93
Checked by: MG
Check date:

Driller's depth:top [feet]: 1033.0
Driller's depth:bottom [feet]: 1045.9
Core type: HQ

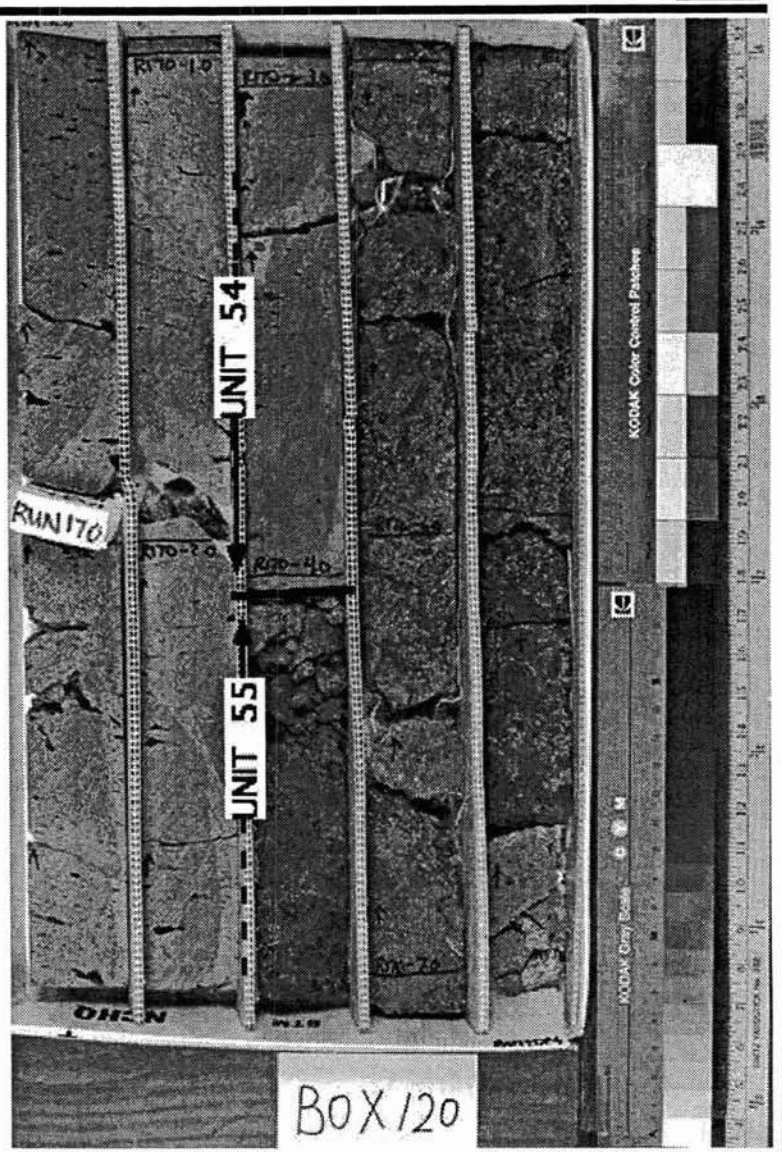
Units in box: 2

BOX UNIT 1: sparsely olivine phyric basalt — UNIT #: 54

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R170-4.1-1039.4')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant to blocky –
<1% at R169-6.5, 2% at R170-2.5.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 medium light gray – **Structures:** – **Sorting:** –
Vesicles: see below – 1-10 mm – irregular – sub-horizontally elongated –
14% at R169-6.5, 3% at R170-2.5. Vesicle size and abundance decreases with depth. Vesicles form sub-horizontal striations.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 5/5 ft; thin white to yellowish-orange rinds
Additional comments:

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 55

Contacts: Top (ft): (R 170-4.1-1039.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
rubble top
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 2-4 mm – blocky (<3:1:1) –
8% iddingsitized olivines identifiable in fresher basalt clasts
– – – –
– – – –
Groundmass/Matrix: microcrystalline clasts in clay-rich matrix of smaller – lithic fragments
Color: moderate brown 5YR 4/4 – **Structures:** – **Sorting:** –
Vesicles: <5% to 10% – 1-5 mm – irregular – –
Alteration: moderately (10-40% altered) –
>40% to <10%, decreasing with depth
Veins:
Fractures:
Additional comments:
Subrounded to subangular basalt breccia in a highly altered/oxidized clay-rich matrix. Clasts vary greatly in the amount of internal alteration. Fresher clasts are moderately olivine phyric.
J. Lockwood comment, 11/19/93 (re weathered zone at top of Unit 55): heavy weathering probably indicates the passage of "a long time", perhaps several thousand years
F. Trusdell comment, 11/19/93 (re the same zone): basalt clinker?



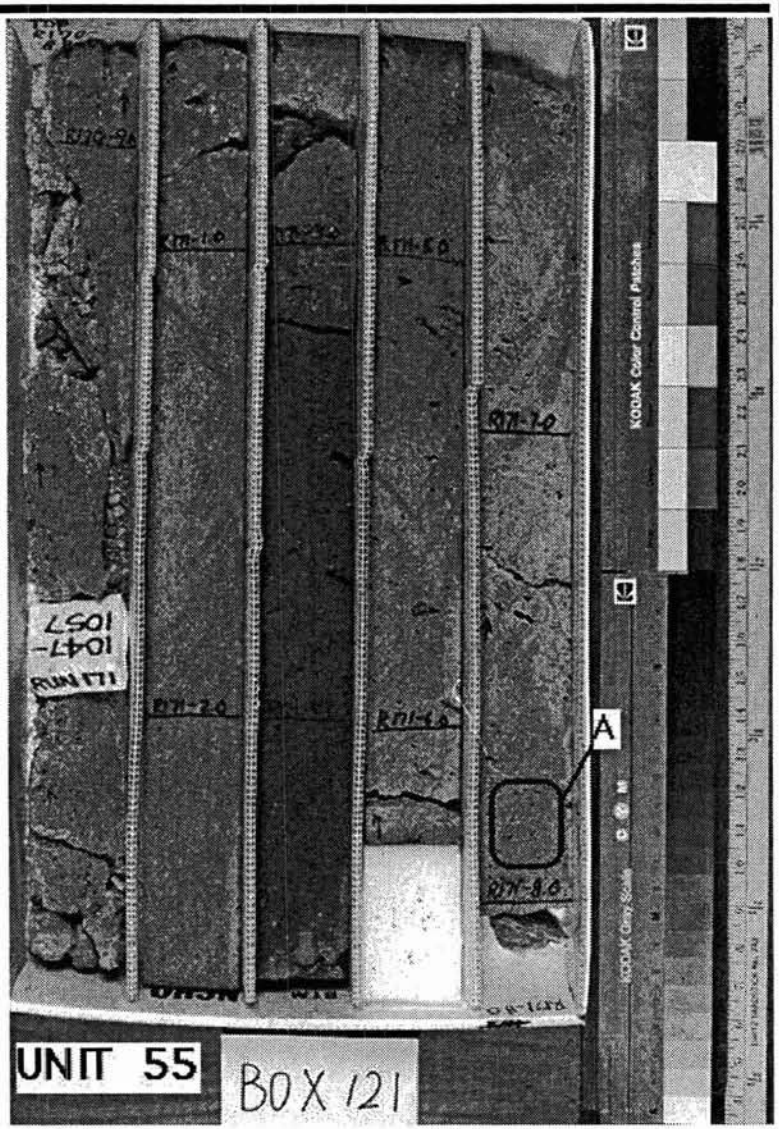
Box #:	Cores in box
121	170 171

Loggers:	MBB
Date logged:	11/11/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1045.9
Driller's depth:bottom [feet]:	1055.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:55**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 18% – 3-4 mm – equant to tabular –
18% at R170-2.5; olivine phenocrysts contain spinel inclusions and are present as crystal clots. From R170-8.8 to bottom of R170 and from R171-0.0 to R171-1.5, olivines are almost completely oxidized or altered to iddingsite.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 5-10 mm – subrounded to subangular – elongate–
Both large (>10 mm) and small vesicles are generally subhorizontal.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 6/7.3 ft; rubbly zone from R171-0.0 to R171-1.0
Additional comments:
see photo: "A" = a vesicular olivine + plagioclase inclusion; similar vesicular mafic phase + plagioclase inclusions are present in this unit; vast majority are <2 mm in longest dimension



Box #: 122	Cores in box
	171
	172
	173

Loggers:	MBB
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1055.1
Driller's depth:bottom [feet]:	1064.5
Core type:	HQ
Units in box:	3

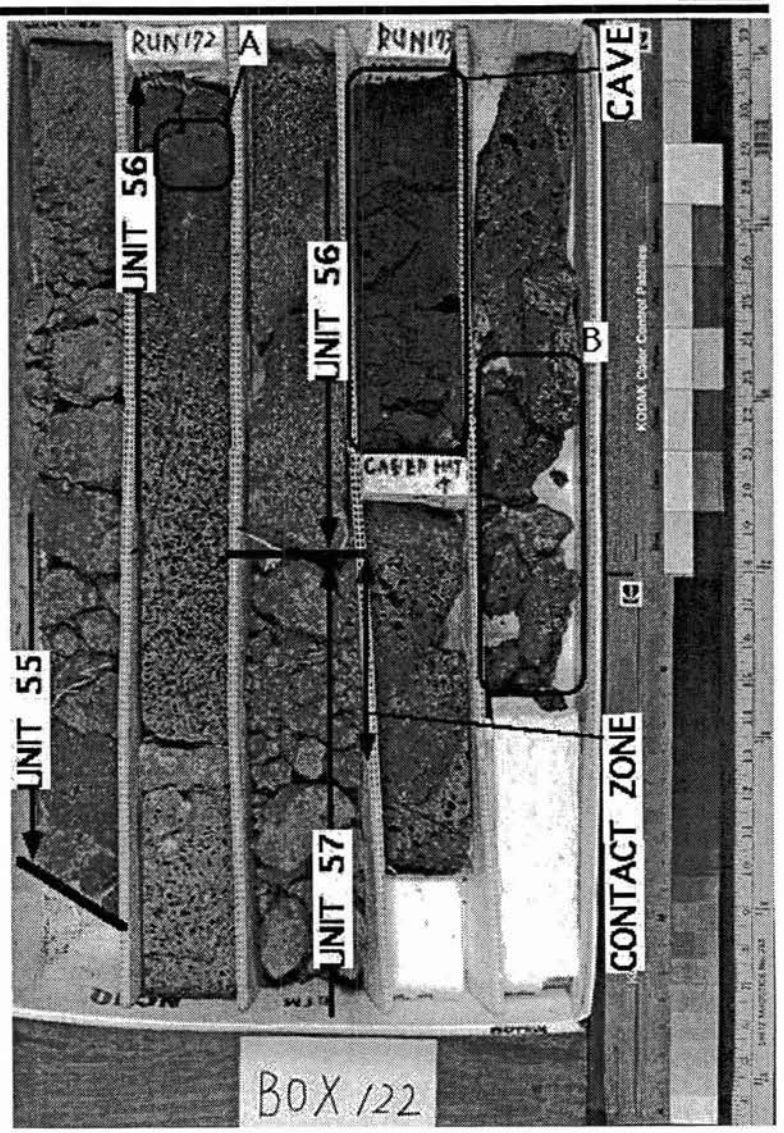
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 55

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R172-0.0-1057.0')(flow contact)
Flow contact denoted by increased oxidation/weathering, rubbly character of zone and a change in lithology below R172-0.0.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 12% – 2-4 mm – equant to tabular –
12% at bottom of flow; below R171-8.5 the olivines are almost completely iddingsitized.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-angular – equant to elongate –
Alteration: moderately (10-40% altered) –
Near the contact the groundmass has a reddish, oxidized tint.
Veins: none
Fractures: highly fractured; i.e., rubbly
Additional comments:
Color determined on less oxidized piece at R171-8.0.

BOX UNIT 2: aphyric basalt — UNIT #: 56

Contacts: Top (ft): (R 172-0.0-1057.0')(flow contact)
Bottom (ft): (R172-3.0-1060.0')(flow contact)
Poor recovery has obscured lower flow contact; oxidized vesicular rubbly zone suggest as contact, however the basalt at the top of R173 looks similar to the unit in R172.
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
plagioclase – <1% – 1-2 mm – tabular (>3:1:1) –
plagioclase appear altered (milky-white in color - sericite?)
olivine – <<1% – <1 mm – equant –
Olivines are completely iddingsitized.
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – ≤5 mm – subrounded to subangular – equant to sub-horizontally elongate –
Vesicles vary in size and volume% throughout section - see photo. Vesicle surfaces have reddish iron-oxide coatings.
Alteration: fresh (<2% altered) –
oxidation near both flow contacts
Veins: none
Fractures: weakly fractured: 7/3 ft
Additional comments:
"A" = layer of red clay infilling fracture/vug near top of flow; precursor may have been a wind-blown ash. Contact between clay and basalt is relatively sharp. Groundmass contains abundant plagioclase laths.

BOX 122 CONTINUED ON NEXT PAGE



Box #:	Cores in box
122	171 172 173

Loggers:	MBB
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1055.1
Driller's depth:bottom [feet]:	1064.5
Core type:	HQ
Units in box:	3

BOX UNIT 3: aphyric basalt

UNIT #: 57

Contacts: Top (ft): (R 172-3.0-1060.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
As noted in the lower contact description for unit 2, the flow contact is not definitive.

Unit type: massive
For description of unit, see unit 2.

Phenocrysts/Clasts:
aphyric (<1%) –
plagioclase – <1% – 1-2 mm – tabular –
olivine – <1% – <<1 mm – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 med. gray– **Structures:** – **Sorting:** –

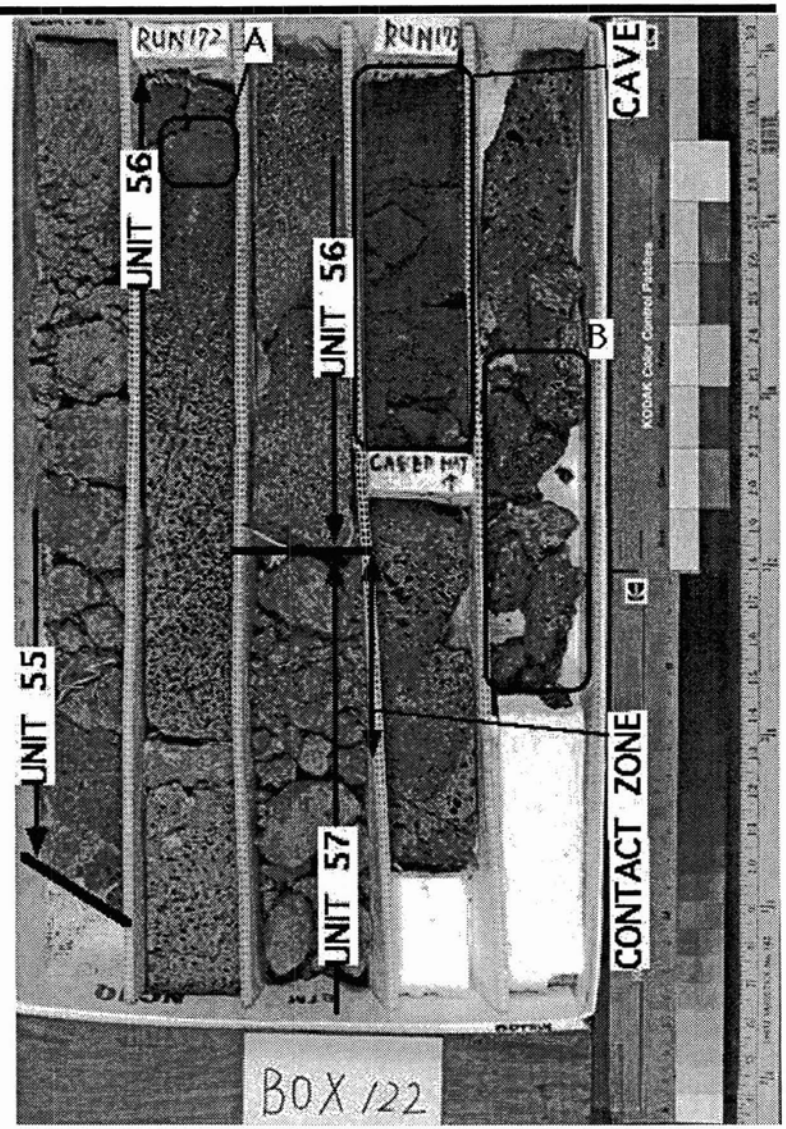
Vesicles: 20-30% – 2-4 mm – round – equant–

Alteration: slightly (2-10% altered) –

Veins: none

Fractures: moderately to highly fractured; "B" (see photo) = rubbly zone; surfaces of the rubble have a coating of white to brown material (weathering products - iron oxides & clays?)

Additional comments:



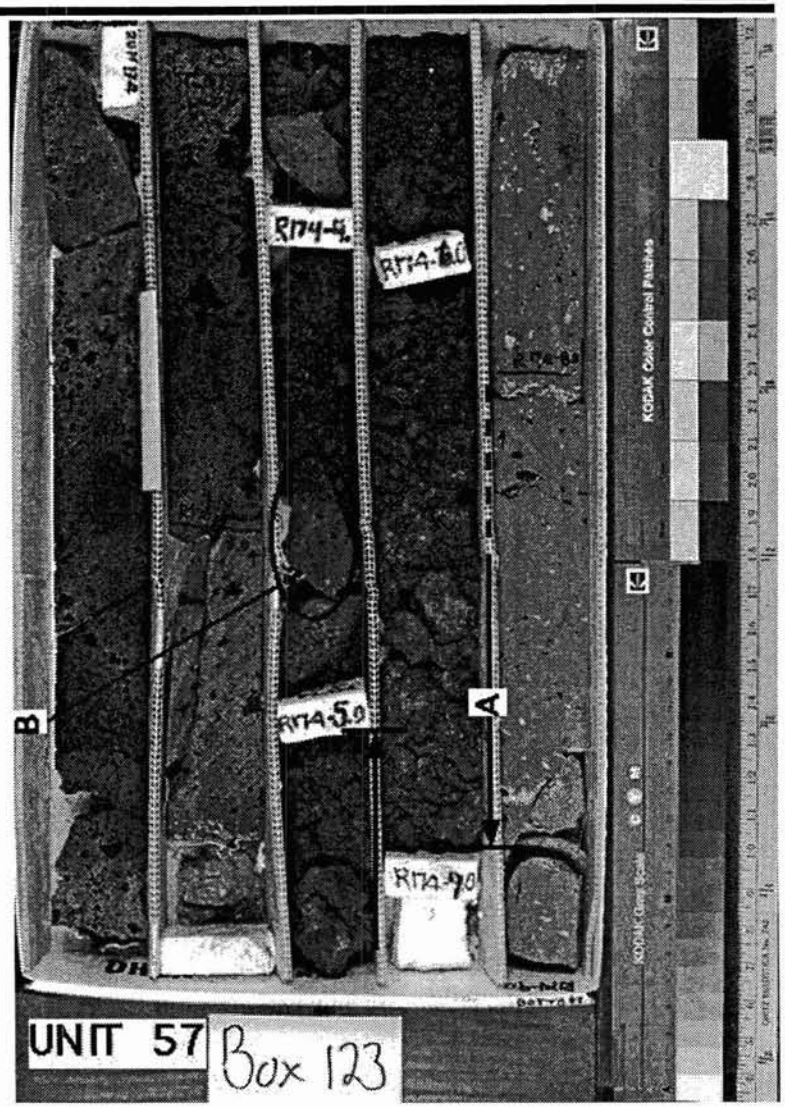
Box #:	Cores in box
123	174

Loggers:	MBB
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1064.5
Driller's depth:bottom [feet]:	1072.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:57**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Although an altered zone (marked "A" on photo) may be a contact, the lack of lithologic change across it suggests it is an internal weathering horizon of a rubbly region of the flow. This is supported by relatively fresh pieces in the altered zone ("B" in photo).
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
plagioclase – ~1% – 1 mm – tabular (>3:1:1) –
olivine – <<1% – ~1 mm – equant –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 2-4 mm – round – inclined elongate–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 1/2 ft
Additional comments:



Box #: 124

Cores in box
174
175

Loggers: MG
Date logged: 11/12/93
Checked by: MG
Check date:

Driller's depth:top [feet]: 1072.6
Driller's depth:bottom [feet]: 1080.4
Core type: HQ
Units in box: 2

BOX UNIT 1: aphyric basalt

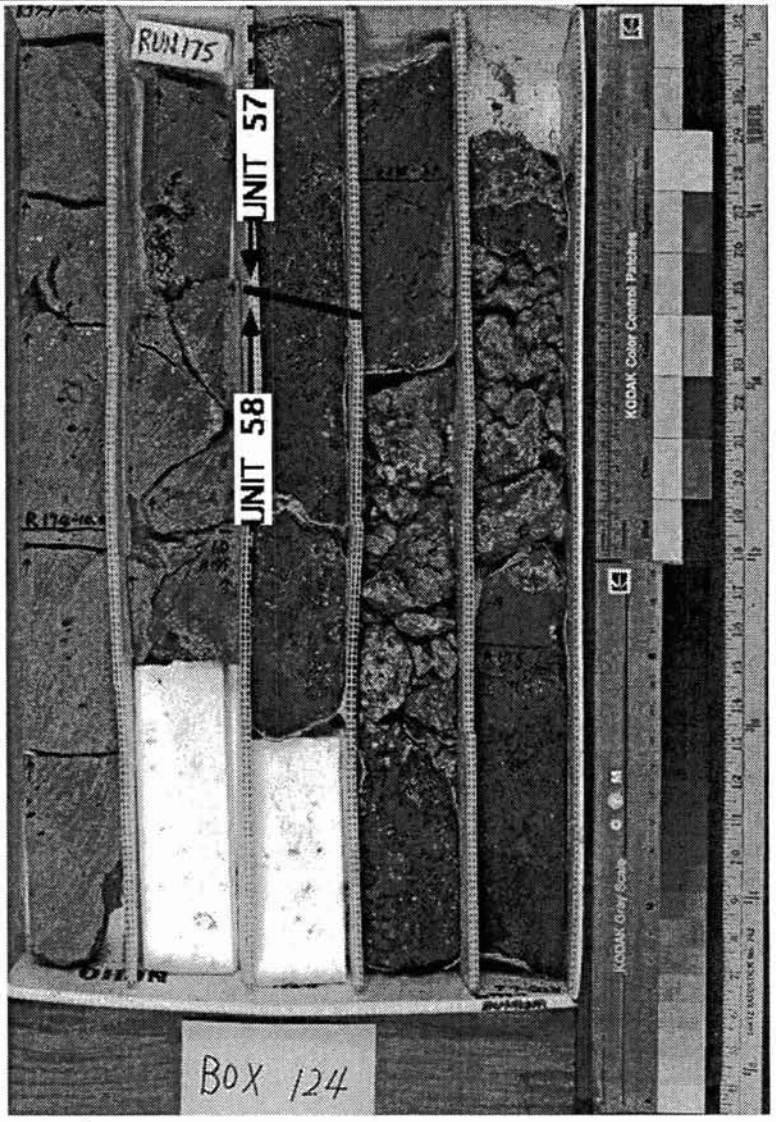
UNIT #: 57

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 175-1.3-**1076.7**')(depositional)
Red zone marks top of lower flow; rubble at base of this flow.
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) – 200 points counted
plagioclase – ~1% – 1 mm – tabular (>3:1:1) –
olivine – <<1% – 1 mm – equant –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 2-4 mm – – –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 4/2 ft
Additional comments:

BOX UNIT 2: aphyric basalt

UNIT #: 58

Contacts: Top (ft): (R 175-1.3-**1076.7**')(depositional)
Bottom (ft): (R--')(continuous with next box)
red baked zone at top
Unit type: aa
rubbly top
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10YR 4/2 dk. yellow. brown– **Structures:** – **Sorting:** –
Vesicles: variable – 1-5 mm – sub-rounded – horizontally elongated–
< 5% to 10-20 %
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: rubbly
Additional comments:
weathered top of aa flow



Box #:	Cores in box
125	175 176 177

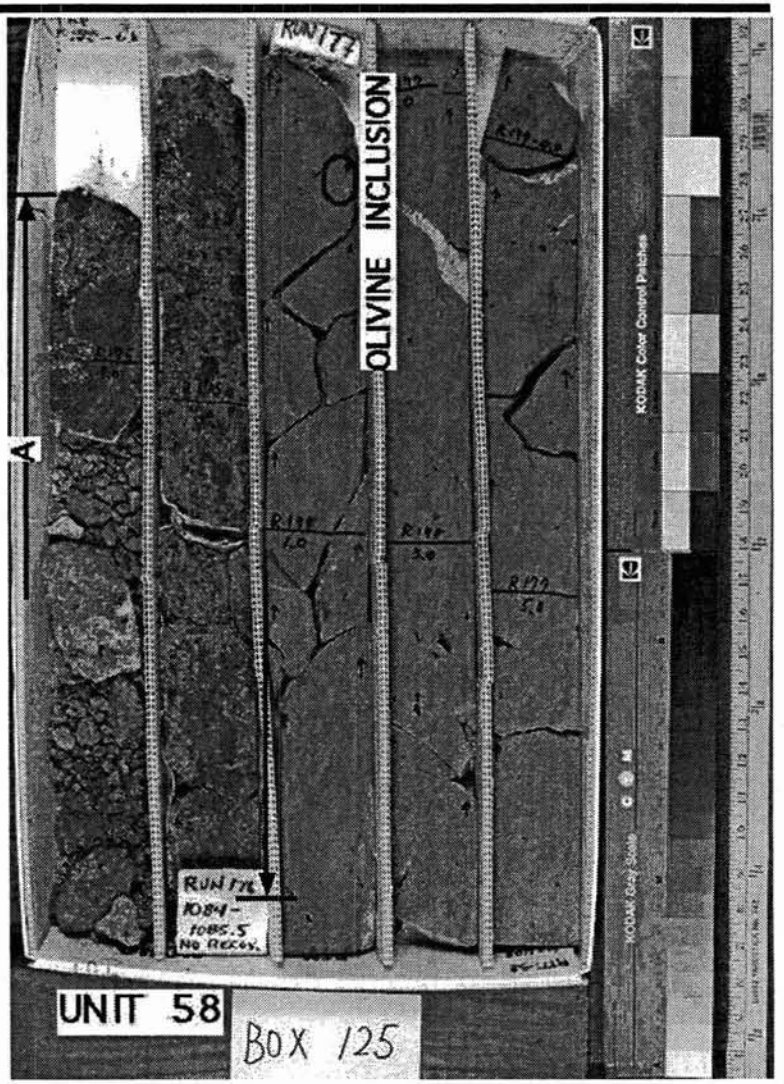
Loggers:	MBB
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1080.4
Driller's depth:bottom [feet]:	1091.2
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:58

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa to massive
rubbly top
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <<1% – <1 mm – equant –
substantial percentage of the rare olivine phenocrysts are iddingsitized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 2-10 mm – sub-angular – vertically elongated –
Alteration: fresh (<2% altered) –
white material coating fracture surfaces and some vesicle surfaces
Veins: none
Fractures: weakly fractured: 20/5.8 ft
Additional comments:
"A" = zone of subrounded to subangular weathered/oxidized basalt clasts (generally ≤20 mm in diameter) set in a clay matrix. This zone is the top of an aa flow. The partially rounded clasts suggest the action of a stream flowing along the top of the flow. In unweathered massive portion of flow, subhorizontal to subvertical sheared vesicle trains become more subhorizontal with increasing depth within box.



Box #: 126

Cores in box
177
178

Loggers: MG
Date logged: 11/12/93
Checked by: MG
Check date:

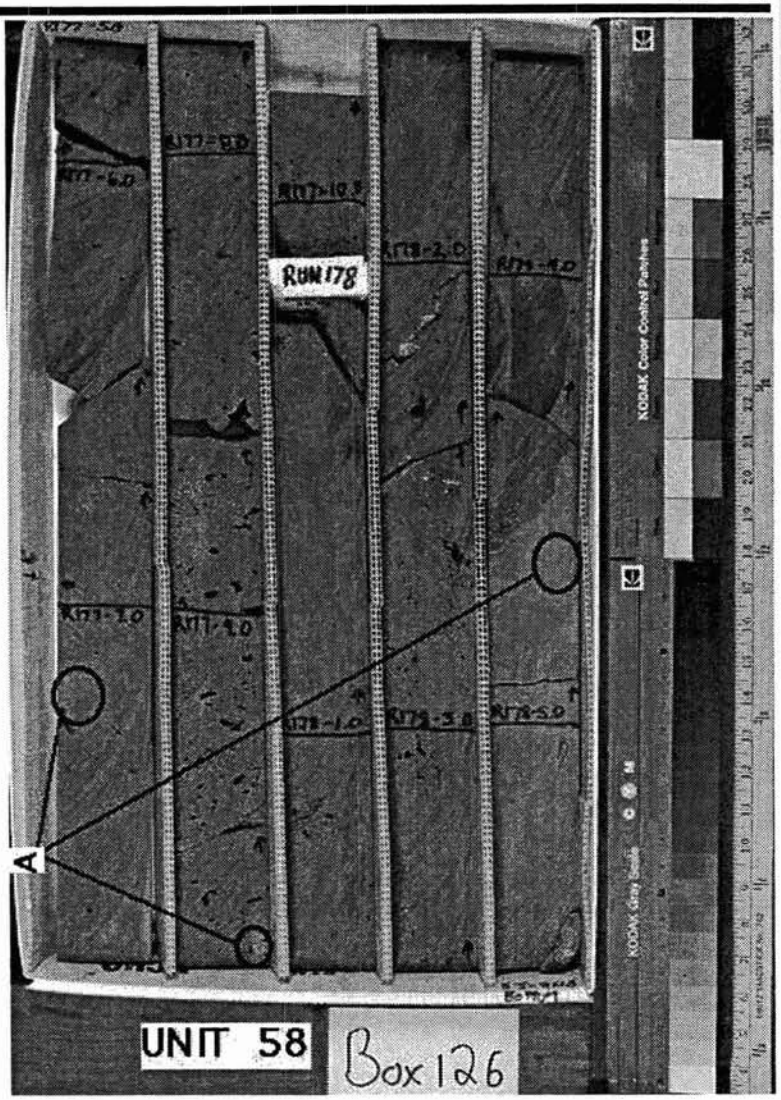
Driller's depth:top [feet]: 1091.2
Driller's depth:bottom [feet]: 1101.2
Core type: HQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:58

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: variable – 1-5 mm – sub-rounded – elongate – <5% to 10-20%
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 9/10 ft; white coating on surfaces
Additional comments:
A=rare dunite inclusions, 0.5 to 1.3 cm in length



Box #:	Cores in box
127	178 179

Loggers: MG
Date logged: 11/12/93
Checked by: MG
Check date:

Driller's depth:top [feet]: 1101.2
Driller's depth:bottom [feet]: 1110.3
Core type: HQ

Units in box: 2

BOX UNIT 1: aphyric basalt

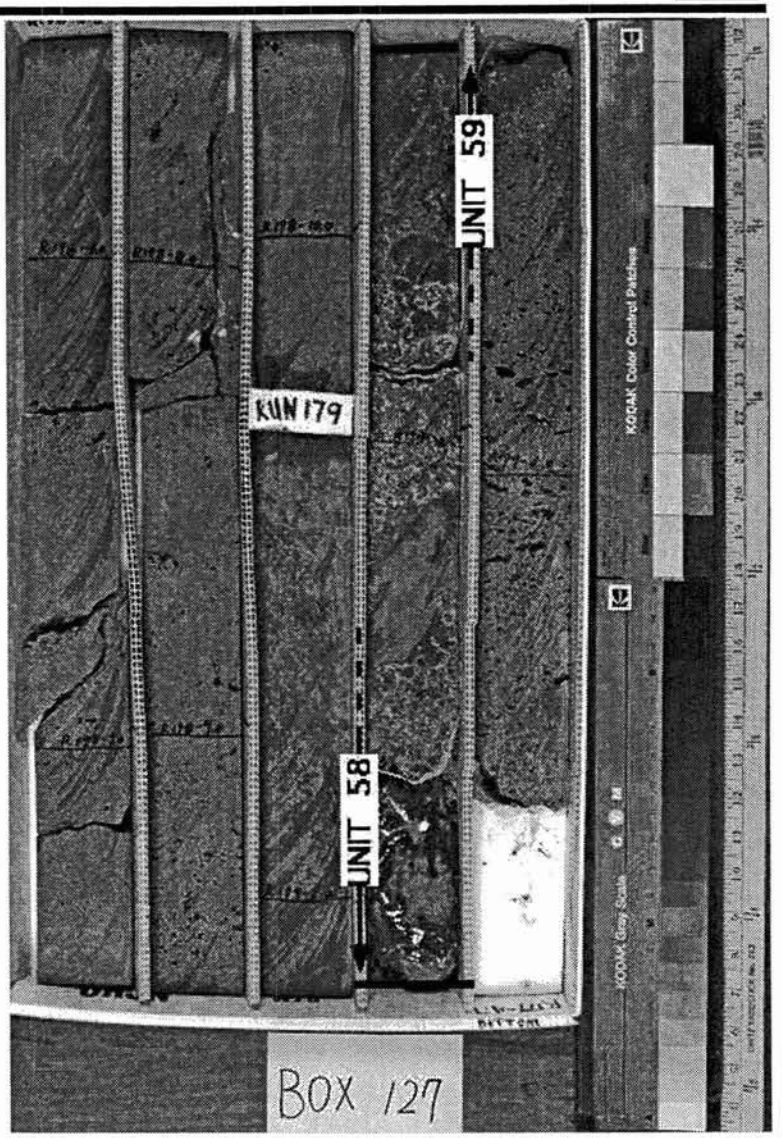
UNIT #: 58

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R179-3.0-1108.9')(depositional) lithology change at rubbly base
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: variable – 1-5 mm – sub-rounded – –
<5% to 10-20 %
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 7/5 ft; white coating on surfaces
Additional comments:

BOX UNIT 2: moderately olivine phyric basalt

UNIT #: 59

Contacts: Top (ft): (R 179-3.0-1108.9')()
Bottom (ft): (R--')(continuous with previous box) oxidized rubbly top
Unit type:
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 1-2 mm – blocky (<3:1:1) –
200 points counted
– – – –
– – – –
Groundmass/Matrix: –
Color: gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm (bimodal) – – –
~1-2 mm; ~1 cm
Alteration: slightly (2-10% altered) –
oxidized
Veins:
Fractures:
Additional comments:
F. Trusdell comment, 11/19/93 (re the rubbly zone at the top of Unit 59 in this and the next box): "all clinker"
J. Lockwood comment, 11/19/93 (re Unit 59): definite Mauna Kea, the plagioclase in the matrix is very distinctive



Box #:	Cores in box
128	179 180

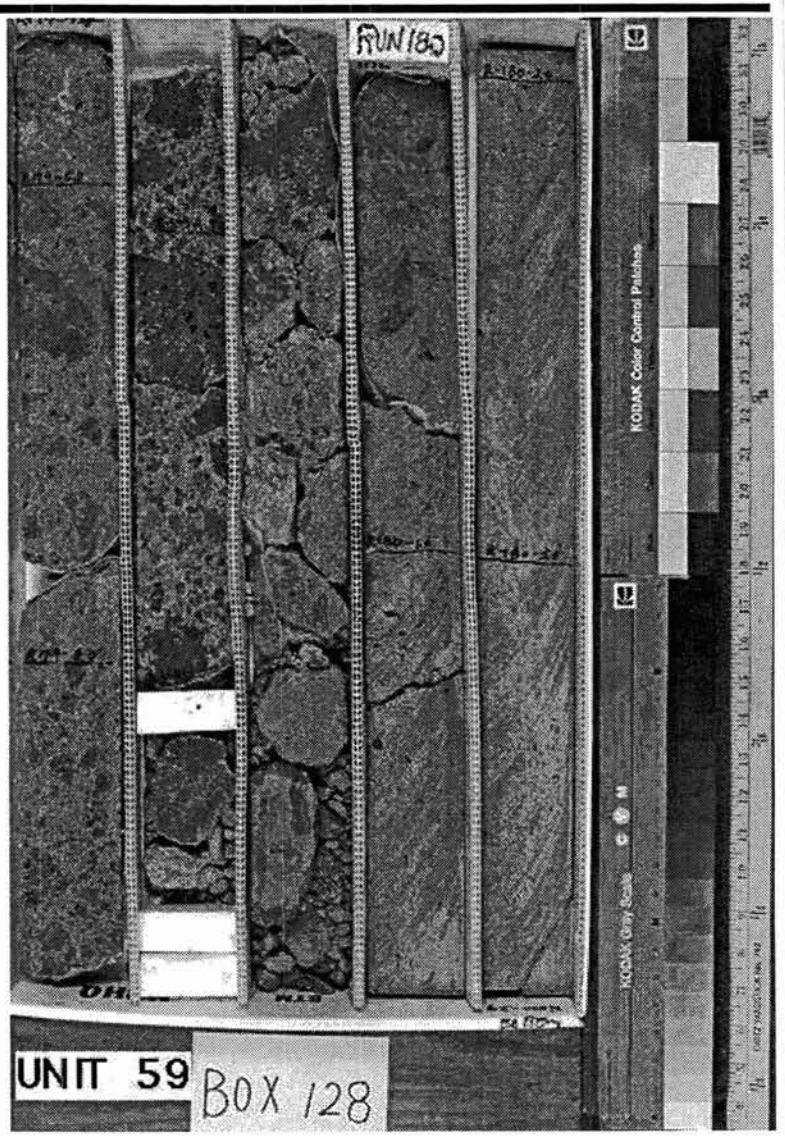
Loggers:	MG
Date logged:	11/12/93
Checked by:	MG
Check date:	11/17/93

Driller's depth:top [feet]:	1110.3
Driller's depth:bottom [feet]:	1120.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:59

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubbly top
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-6% – 2-4 mm – equant –
200 points counted
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 dk. med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 3/4 ft
Additional comments:



Box #:	Cores in box
129	180 181

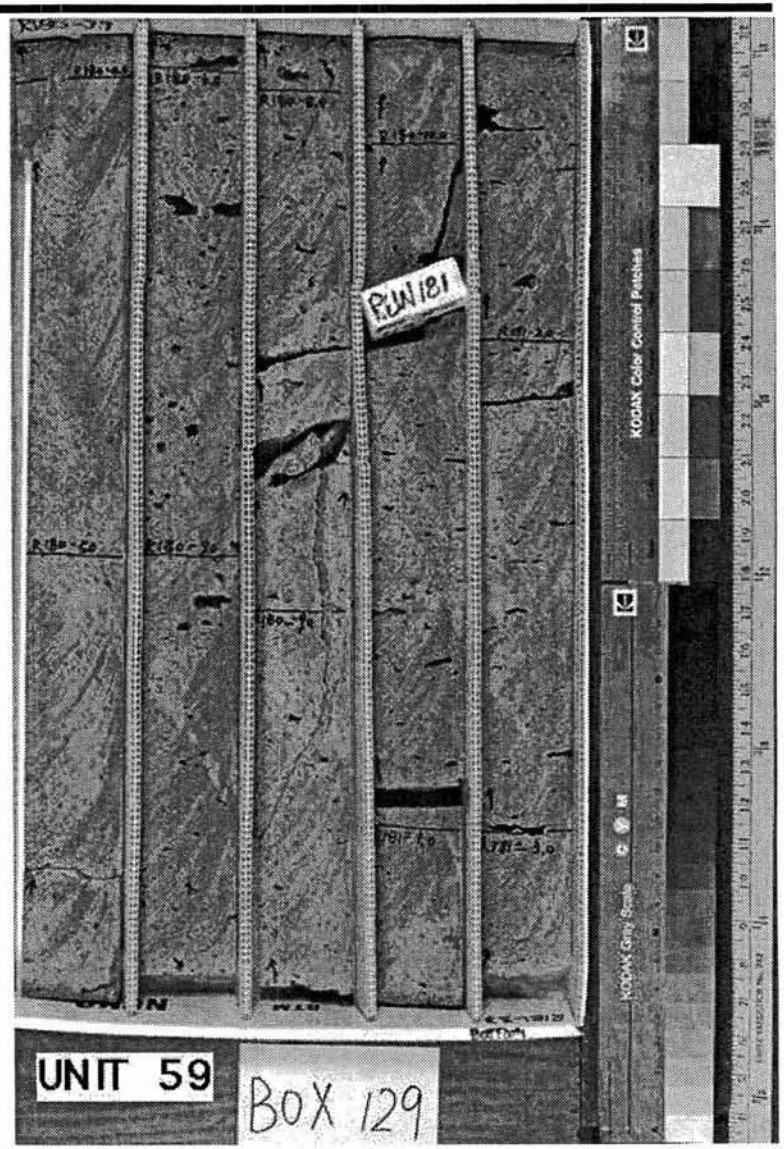
Loggers:	MG
Date logged:	11/12/93
Checked by:	MG
Check date:	11/17/93

Driller's depth:top [feet]:	1120.1
Driller's depth:bottom [feet]:	1130.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:59

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-6% – bimodal – equant to blocky –
1-2 mm, 5-10 mm; 200 points counted
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% – bimodal – sub-rounded – horizontally elongated–
< 1 mm, 2-4 mm; flow banded
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 8/10 ft
Additional comments:



Box #: 130

Cores in box
181
182

Loggers: MG
Date logged: 11/12/93
Checked by: MG
Check date:

Driller's depth:top [feet]: 1130.0
Driller's depth:bottom [feet]: 1139.0
Core type: HQ
Units in box: 2

BOX UNIT 1: moderately olivine phyric basalt

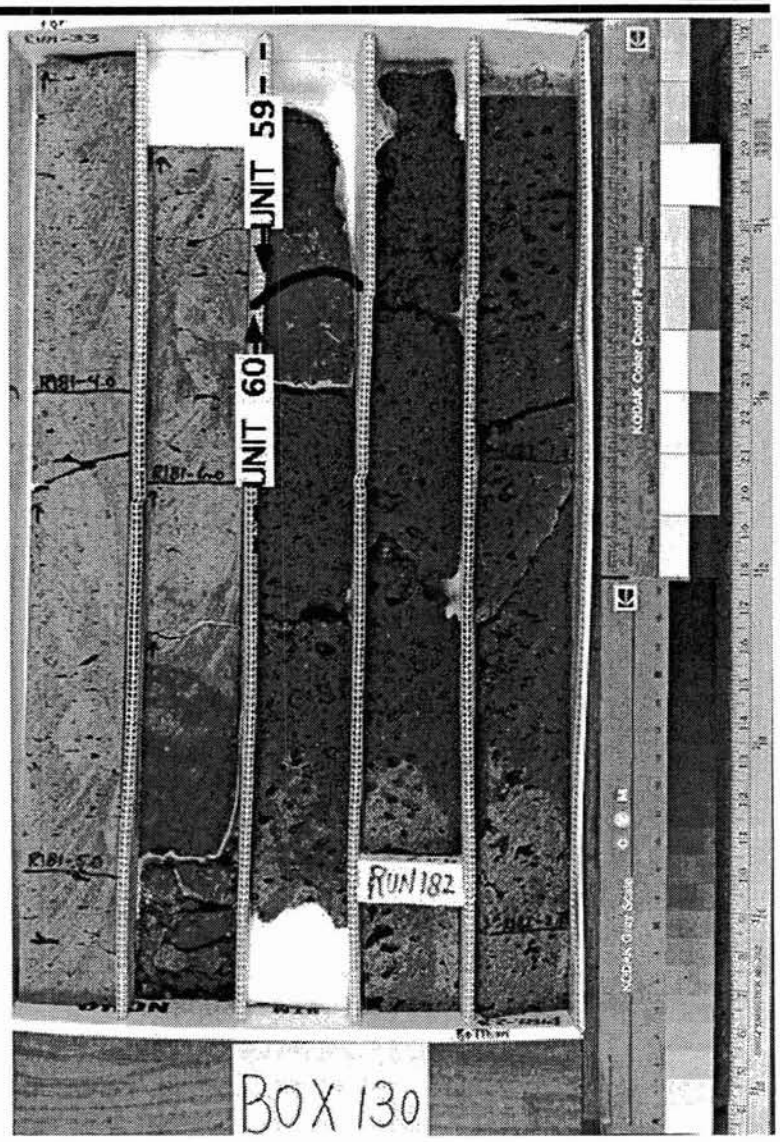
UNIT #: 59

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R181-7.4-1134.0')(depositional)
Rubbly base overlying red baked zone.
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-6% – variable – equant to blocky –
bimodal; 1-2 mm, 3-4 mm; 200 points counted
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-3 mm – sub-rounded – horizontally elongated–
some are larger (~1 cm)
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 3/3.7 ft
Additional comments:

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 60

Contacts: Top (ft): (R 181-7.4-1134.0')(depositional)
Bottom (ft): (R--')(continuous with next box)
red, baked top
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25-30% – 1-3 mm – equant to blocky –
25 & 26 points in two 100 point counts at R182-1.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 3-5 mm – sub-rounded – subhorizontally elongated–
rare 3-5 cm vesicles
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 6/6 ft (some are vesicle-rich zones)
Additional comments:



Box #: 131

Cores in box
182
183

Loggers: MBB
Date logged: 11/12/93
Checked by: MG
Check date:

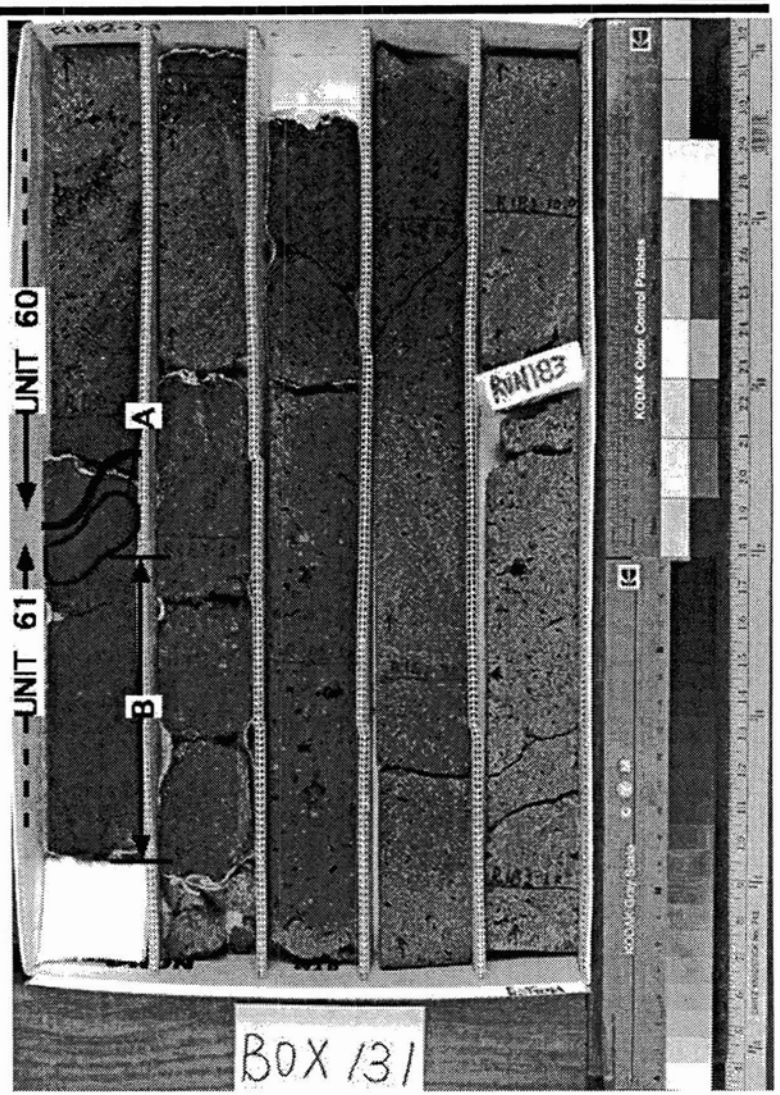
Driller's depth:top [feet]: 1139.0
Driller's depth:bottom [feet]: 1148.0
Core type: HQ
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 60

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R182-3.3-1140.2')(flow contact)
Bottom flow contact defined by the top of the weathered and oxidized ash(?) layer marked "A" in photo. Note, there does not appear to be a lithologic change.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ≥30% – 2-5 mm – equant –
33% at R182-2.9; spinel inclusions in olivine phenocrysts; olivine crystal clots present. Olivine rims altered to iddingsite near flow contact.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1-5 mm – rounded to subangular – equant to elongate –
Higher vesicle volume% near contact; smaller vesicles are rounded, larger ones are horizontally elongate. Right at contact, vesicles are filled with clay.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
Minor oxidation zone 2-5 cm in depth above contact.

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 61

Contacts: Top (ft): (R 182-3.3-1140.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Top flow contact defined by zone of completely oxidized olivines, partially oxidized clasts in a more oxidized matrix.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >30% – 2-4 mm – equant to tabular –
33% at R182-7.0; below highly oxidized zone (labeled "B" on photo), the olivines show some iridescent oxidation coating (MnO?) as well as minor alteration to iddingsite. Olivines occur as crystal clots and contain spinel inclusions.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-20% – <1-10 mm – rounded to subangular – equant to elongate –
Small vesicles are rounded and equant; larger vesicles are more irregularly shaped; largest vesicles are >10 mm in longest dimension and are inhomogeneously distributed (see photo).
Alteration: fresh to highly (<2-80% altered) –
Alteration takes the form of intense weathering and oxidation
Veins: none
Fractures: weakly fractured; minor oxidation and clay formation on some fracture surfaces.
Additional comments:
see photo: "A" = ash layer (?) weathered to clays and then baked by overlying flow. "B" = weathered flow top. Relatively rare olivine + pyroxene inclusions up to ~5 mm observed in fresh portions of the section. Some of the small inclusions look like microgabbro crystal clots.



Box #: 132

Cores in box: 183

Loggers: MBB
Date logged: 11/12/93
Checked by: MG
Check date:

Driller's depth:top [feet]: 1148.0
Driller's depth:bottom [feet]: 1156.8
Core type: HQ

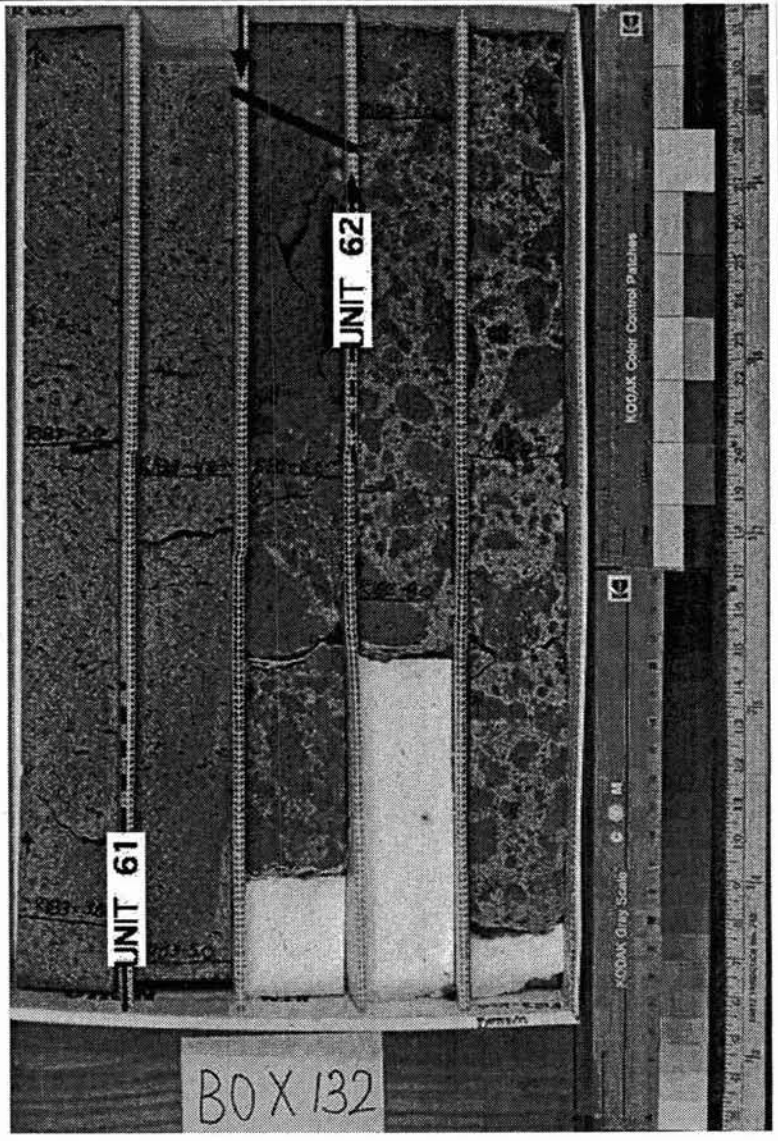
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 61

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R183-5.3-1152.5')(flow contact)
Flow contact marked by a transition from highly olivine phyric material to less olivine phyric basalt clasts in a highly weathered matrix.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-25% – 2-4 mm – equant to tabular –
23% at R183-4.7; olivines occur in crystal clots; no apparent spinel inclusions; minor iddingsite near contact
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 5-10 mm – subrounded to subangular – subhorizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 2/5.2 ft
Additional comments:

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 62

Contacts: Top (ft): (R 183-5.3-1152.5')(flow depositional)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubbly top of flow
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-5% – 1-4 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dark gray – **Structures:** – **Sorting:** –
Vesicles: variable – – – –
scoriaceous rubble
Alteration: –
Veins: none
Fractures: weakly: 3/4 ft
Additional comments:



Box #:	Cores in box
133	183 184 185

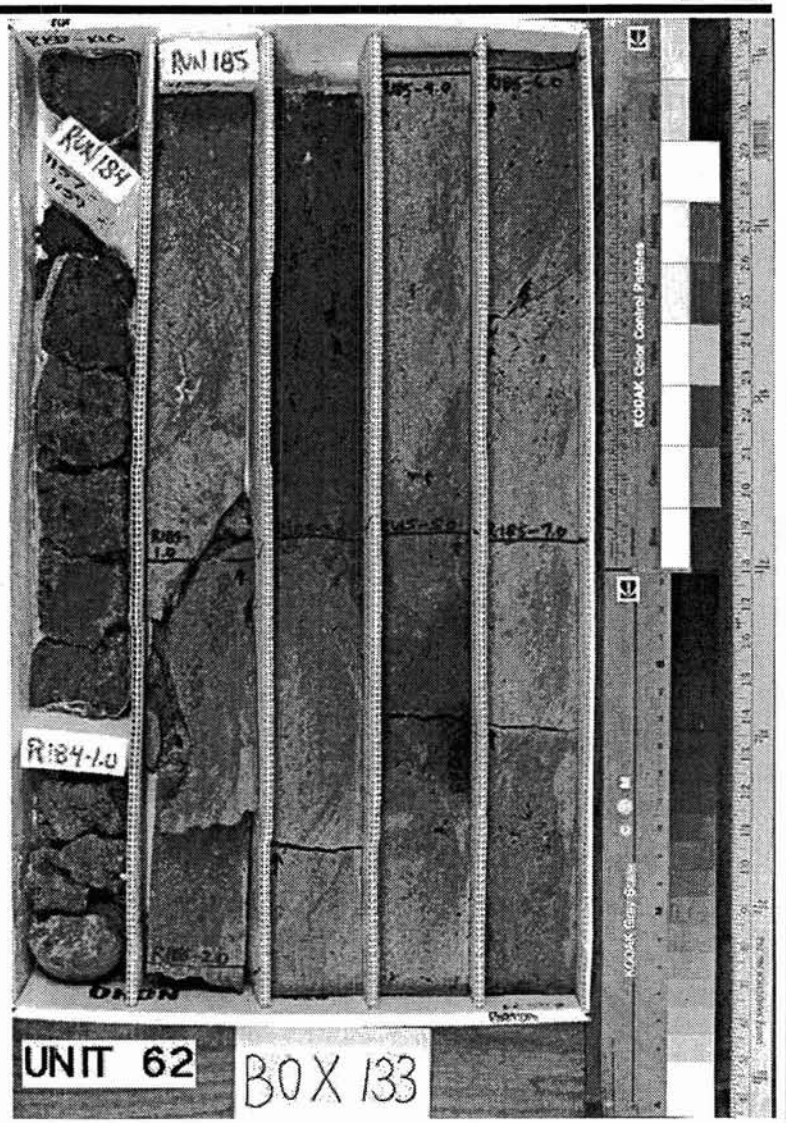
Loggers:	MG
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1156.8
Driller's depth:bottom [feet]:	1166.9
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:62

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
red rubbly top
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-5% – 1-4 mm – equant –
300 points counted at R185-7.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-3 mm – sub-rounded – vertically elongated–
vesicular autoliths at R185-5.5 and 7.5
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 5/8 ft
Additional comments:



Box #:	Cores in box
134	185 186

Loggers:	MG
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1166.9
Driller's depth:bottom [feet]:	1175.9
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt

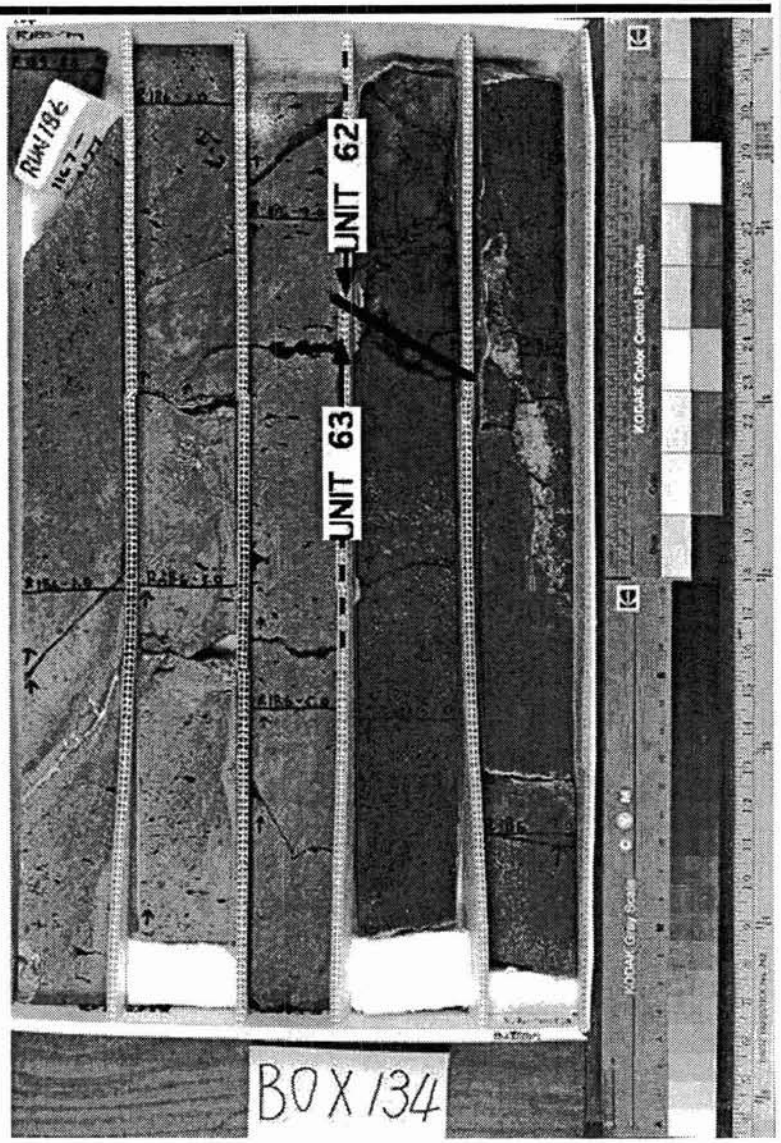
UNIT #: 62

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 186-6.2-1173.2')(depositional)
red baked zone at base
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 2-4 mm – blocky (<3:1:1) –
300 points counted
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 2-4 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 10/6 ft; some are filled with white clay (?)
Additional comments:

BOX UNIT 2: aphyric basalt

UNIT #: 63

Contacts: Top (ft): (R 186-6.2-1173.2')(depositional)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <<1% – 1 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) –
red coating on vesicles
Veins: none
Fractures: weakly fractured: 3/3 ft; 1-2 cm wide fracture filled with white clay (?)
Additional comments:



Box #: 135

Cores in box
186
187

Loggers: MG
Date logged: 11/12/93
Checked by: MG
Check date:

Driller's depth:top [feet]: 1175.9
Driller's depth:bottom [feet]: 1185.9
Core type: HQ

Units in box: 2

BOX UNIT 1: aphyric basalt

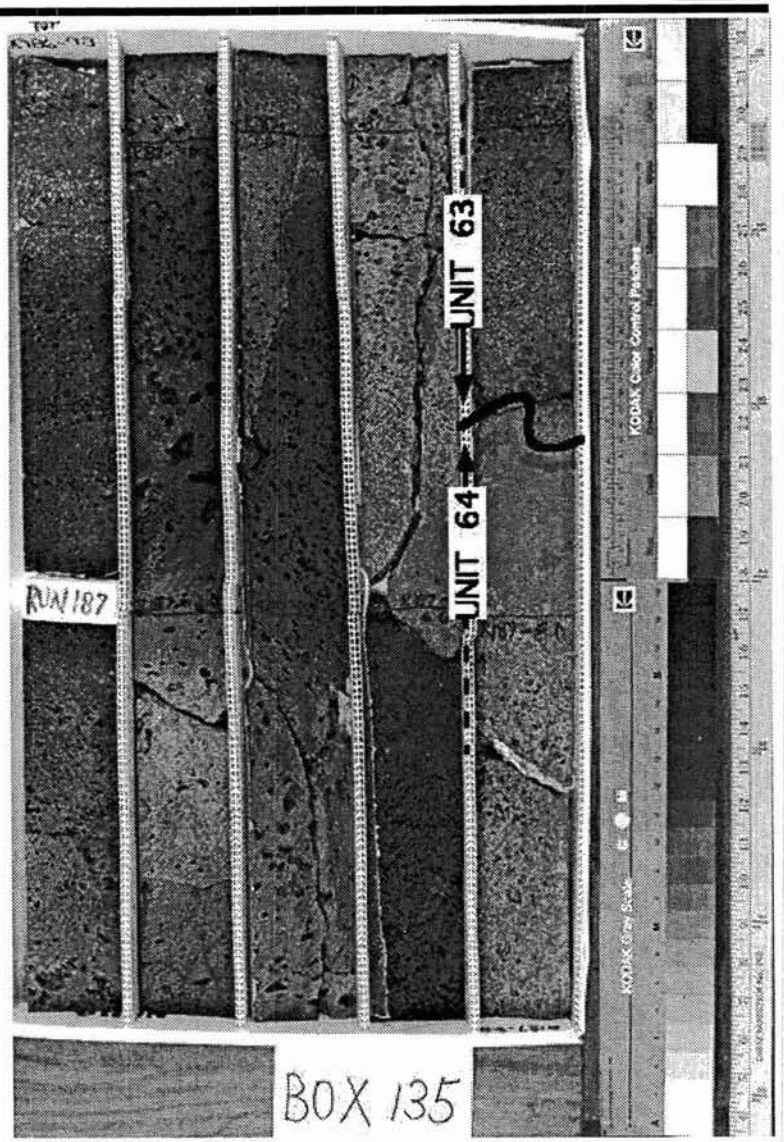
UNIT #: 63

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R187-7.6-1184.9')(depositional)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: variable – variable – spherical – subhorizontally elongated – <5? to 20-30%; 1-2 to 4-8 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 11/8 ft
Additional comments:

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 64

Contacts: Top (ft): (R 187-7.6-1184.9')(depositional)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25-30% – 2-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 3-5 mm – sub-rounded – elongated –
Alteration: slightly (2-10% altered) – reddish lining on vesicles
Veins: none
Fractures: weakly fractured: 1/1 ft
Additional comments:



Box #:	Cores in box
136	187 188

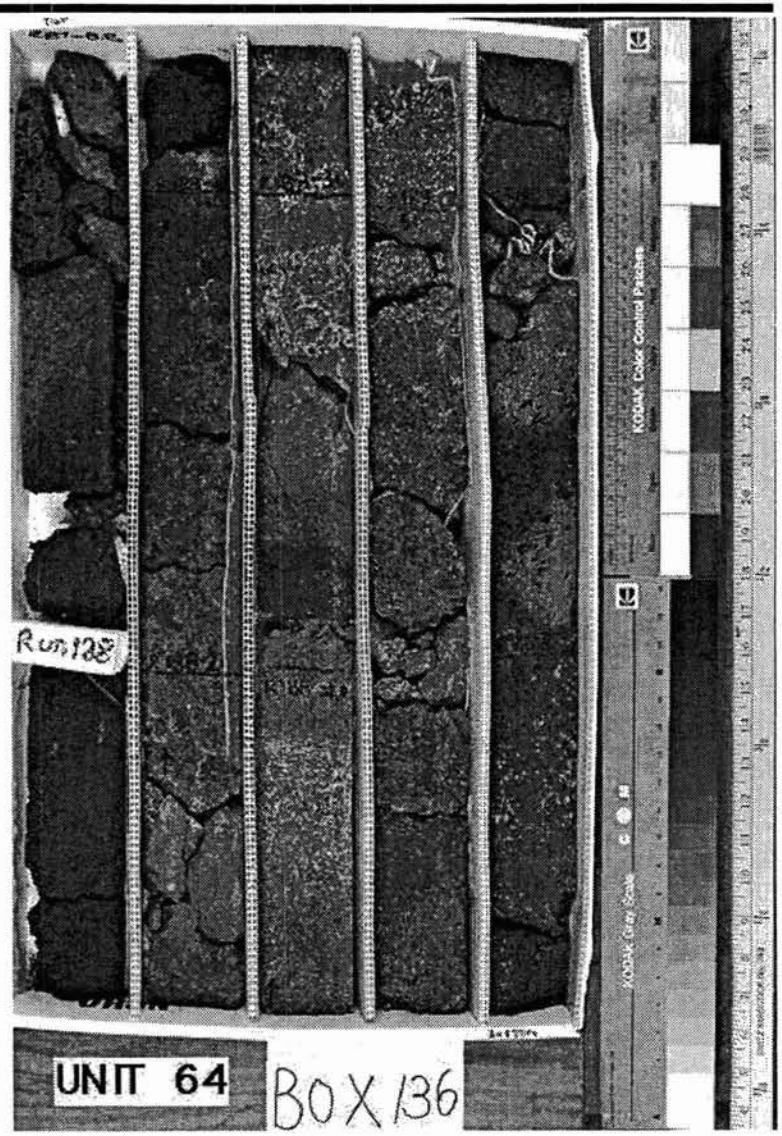
Loggers:	MG
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1185.9
Driller's depth:bottom [feet]:	1195.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:64

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubbly except below R188-7.1
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25-30% – 1-5 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 3-5 mm – spherical – subhorizontally elongated–
Alteration: slightly (2-10% altered) – clay
upper part of box has clay (?) alteration
Veins: none
Fractures: weakly fractured: 10/6 ft
Additional comments:
GPLW comment: nearly all of Boxes 136 and 137 (1187-1203') were identified as "probably tuff ... could be a Sandhills-like littoral pyroclastic deposit; I would however like to see this core again"



Box #:	Cores in box
137	188 189

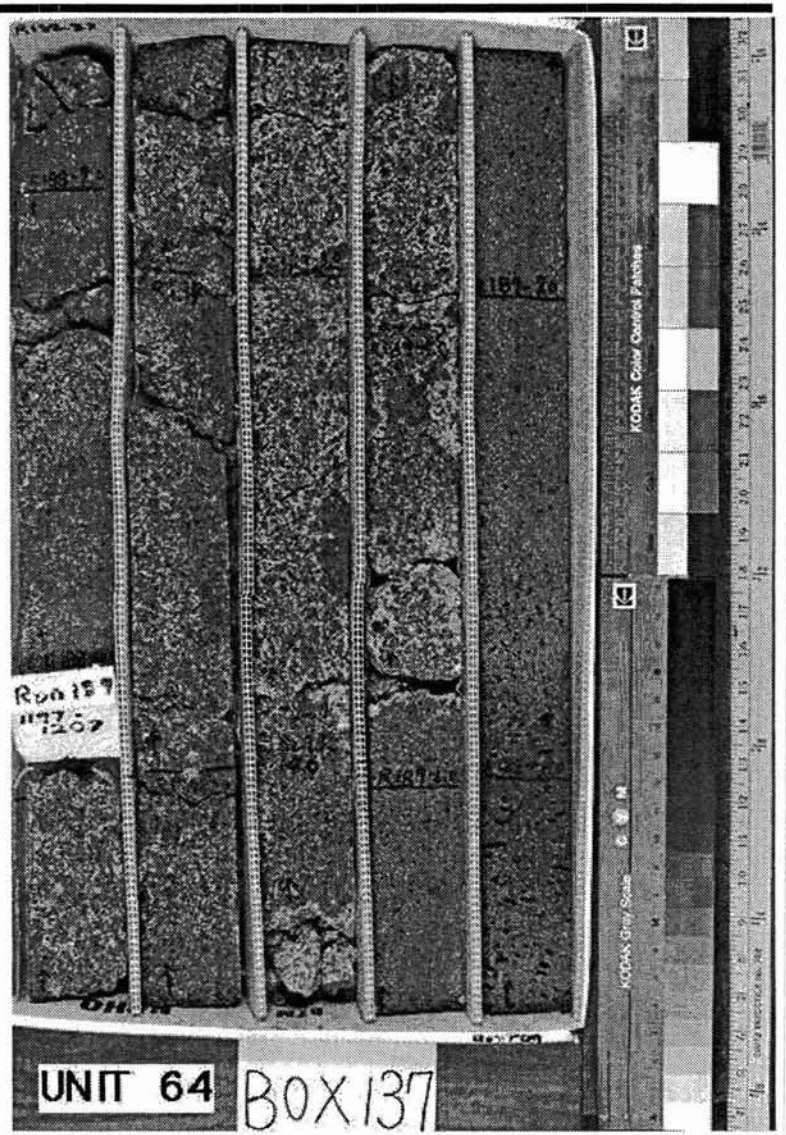
Loggers:	MG
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1195.7
Driller's depth:bottom [feet]:	1205.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:64

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubble except below R189-5.8
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25-30% – 2-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1 mm – sub-rounded – elongated–
vertical to horizontally oriented
Alteration: moderately (10-40% altered) – clay (?)
Veins: none
Fractures: weakly fractured: 12/10 ft
Additional comments:
GPLW comment: nearly all of Boxes 136 and 137 (1187-1203') were identified as a "probably tuff ... could be a Sandhills-like littoral pyroclastic deposit; I would however like to see this core again"



Box #:	Cores in box
138	189 190

Loggers: MBB
Date logged: 11/12/93
Checked by: MG
Check date:

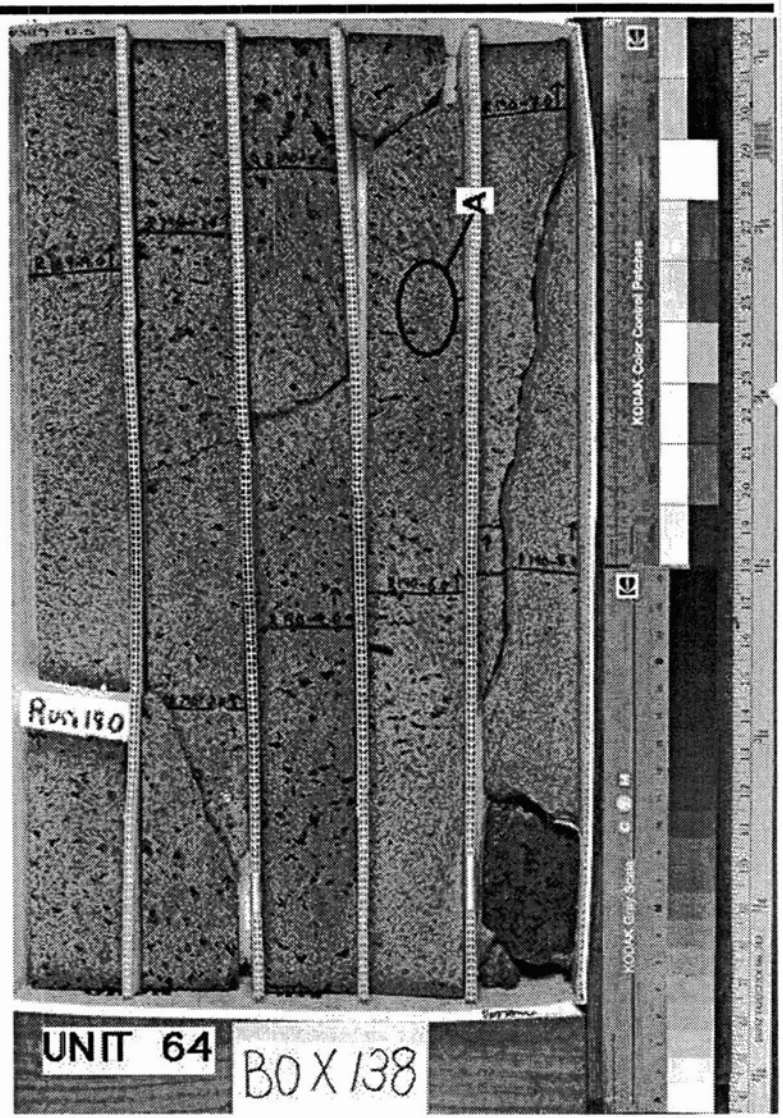
Driller's depth:top [feet]: 1205.5
Driller's depth:bottom [feet]: 1215.9
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:64

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 32% – 2-4 mm – equant to tabular –
32% at R189-9.5; olivine phenocrysts contain spinel inclusions; olivine clots are present. Alteration includes minor iddingsite and oxidation (black discoloration). Olivines are more oxidized in the region R190-0.6 to R190-6.1.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-15% – 2-10 mm – subrounded to subangular – equant to elongate –
Alteration: slightly (2-10% altered) –
groundmass has reddish tint indicative of oxidation
Veins: none
Fractures: weakly fractured: 5/10 ft; reddish-brown discoloration on some fracture surfaces
Additional comments:
see photo: "A" = microgabbro inclusion



Box #:	Cores in box
139	190 191

Loggers:	MG, MBB
Date logged:	11/12/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1215.9
Driller's depth:bottom [feet]:	1225.2
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt

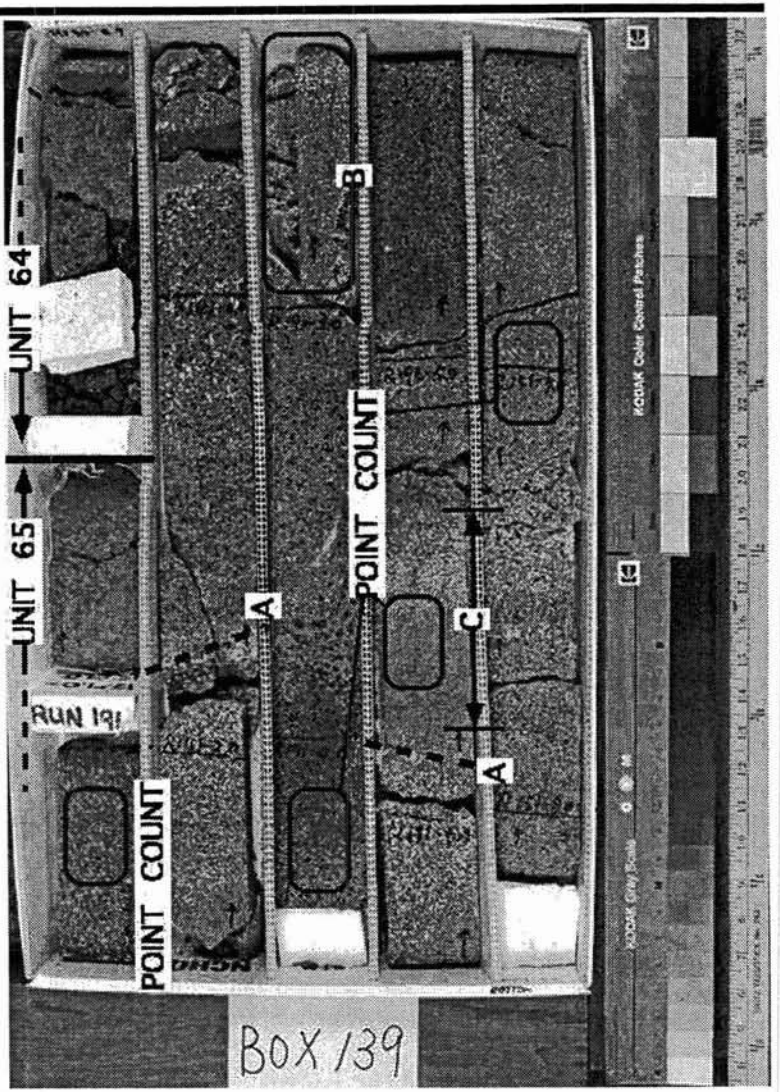
UNIT #: 64

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R190-9.5-1216.9')(flow contact)
Red zone marks top of next flow.
Unit type: aa (?)
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-30% – 2-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-2 mm – spherical – equant–
Alteration: moderately (10-40% altered) – clay + oxidation
Veins: none
Fractures: none
Additional comments:
weathered base of flow

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 65

Contacts: Top (ft): (R 190-9.5-1216.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 6-40% – 2-3 mm – equant –
18% at R191-0.3; 40% at R191-4.2; 6% at R191-5.7; 28% at R191-7.0; olivine volume% quite variable within section. Iridescent (MnO?) coatings on some grains throughout section; within interval R191-0.0 to R191-1.0, olivines are completely oxidized/iddingsitized.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray– **Structures:** – **Sorting:** –
Vesicles: 10-30% – 1-5 mm – rounded to subrounded – equant to elongate–
Elongate vesicles have no preferred orientation. Vesicles near fractures are filled with clays and zeolites (?).
Alteration: slightly to very highly (2-95% altered) –
Degree of oxidation decreases down section away from contact.
Veins: none
Fractures: Weakly fractured: 15/8 ft; localized zones (e.g., "B" on photo) are highly fractured. Fractures are zones of increased weathering and clay development.
Additional comments:
"A" = possible internal flow contacts. "C" = relatively olivine-poor zone; may represent a separate flow, or be indication of flow differentiation.



Box #: 140

Cores in box
191
192

Loggers: MBB
Date logged: 11/13/93
Checked by: MG
Check date:

Driller's depth:top [feet]: 1225.2
Driller's depth:bottom [feet]: 1234.9
Core type: HQ

Units in box: 3

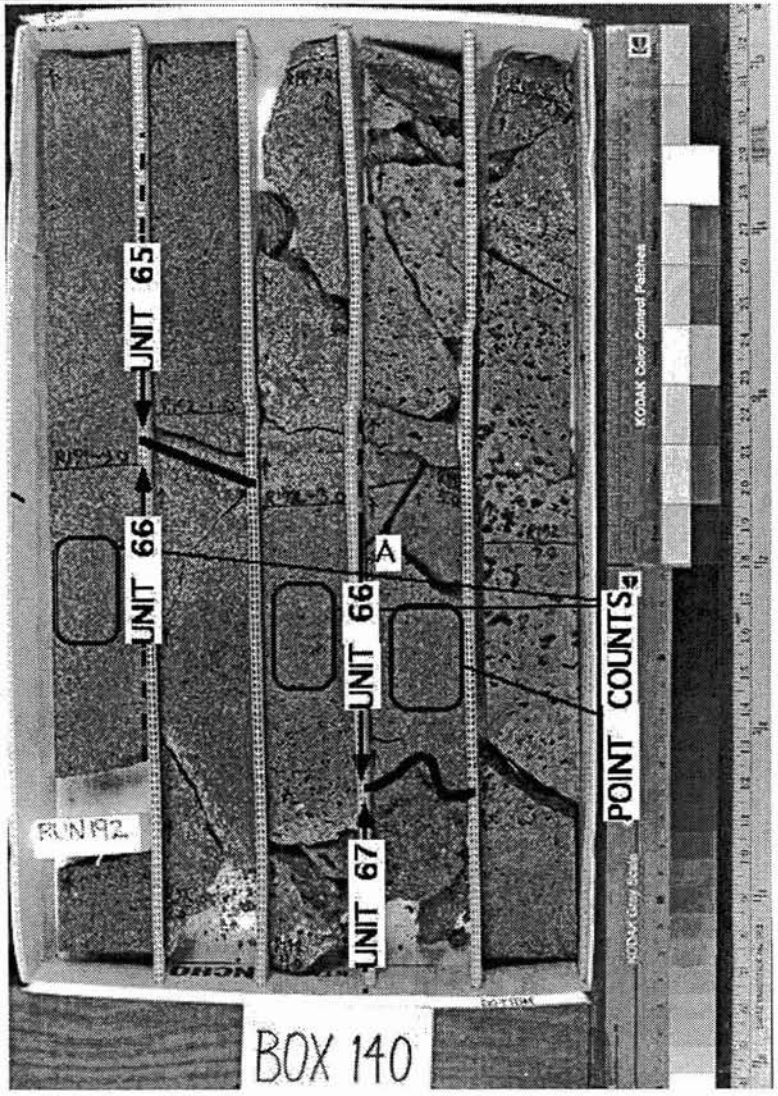
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 65

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R192-1.2-1228.3')(flow contact)
Flow contact defined by an ~1 cm thick oxidation zone and more vesicles at the top of the lower flow as well as a lithologic change from a more to a less olivine phyric basalt.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 3-4 mm – equant to tabular –
45% at R191-9.3; this region is an olivine-rich cumulative zone at the basal part of the flow; olivine volume% is variable. Olivines have iridescent oxidation coating and display minor iddingsite alteration.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – subrounded to subangular – equant to elongate –
Alteration: slightly (2-10% altered) –
groundmass has faint reddish tint of oxidation
Veins: none
Fractures: weakly fractured
Additional comments:

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 66

Contacts: Top (ft): (R 192-1.2-1228.3')(flow contact)
Bottom (ft): (R192-5.7-1232.8')(flow contact)
For description of top flow contact, see description in unit 1.
Unit type: massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – ~1% – 1-2 mm – equant –
<1% at R192-3.4; within 2 ft of upper contact, olivine phenocrysts are almost completely altered to iddingsite, 200 points counted at R192-1.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-30% – 2-5 mm – subrounded to subangular – equant to elongate –
Photo shows the extent of the variability in vesicle size and volume%; rare vugs are present in section; more fractured regions of the core display greater amounts of clay/zeolite (?) in the vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: moderately fractured
Additional comments:
see photo: "A" = olivine + plagioclase crystal clot.

BOX 140 CONTINUED ON NEXT PAGE



Box #:	Cores in box
140	191 192

Loggers:	MBB
Date logged:	11/13/93
Checked by:	MG
Check date:	

Driller's depth:top [feet]:	1225.2
Driller's depth:bottom [feet]:	1234.9
Core type:	HQ
Units in box:	3

BOX UNIT 3: aphyric basalt **UNIT #: 67**

Contacts: Top (ft): (R 192-5.7-1232.8')(flow contact)
Bottom (ft): (R 192-8.0-1235.1')(continuous with next box)
Top flow contact defined by a decrease in vesicle size toward contact and the presence of a cm thick brown oxidized/weathered zone. This may be an internal contact. Note: base of this unit is a few inches into the next box.

Unit type: massive

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – ≤1 mm – equant –
Olivines display minor iddingsite alteration.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium gray– **Structures:** – **Sorting:** –

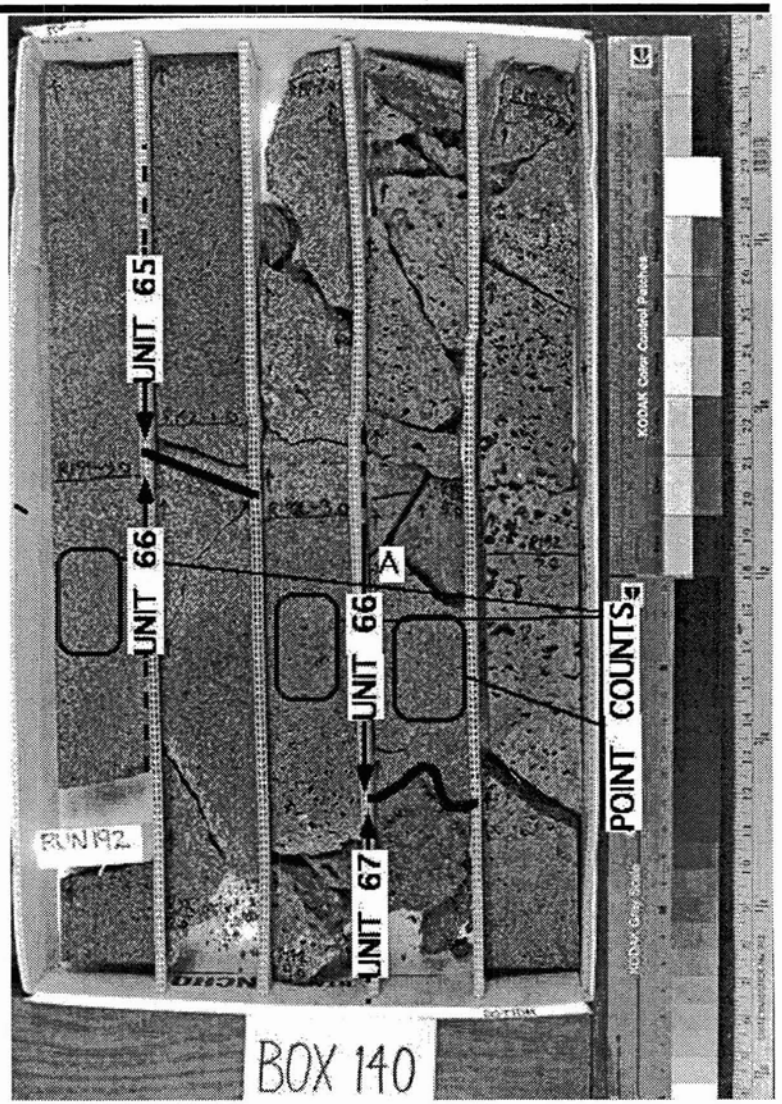
Vesicles: 10-20% – 1-10 mm – subrounded to subangular – equant to sub-horizontally elongate –
vesicles size and volume% is variable within this section - see photo

Alteration: slightly (2-10% altered) –
clay in vesicles

Veins: none

Fractures: weakly fractured

Additional comments:
Olivine + plagioclase crystal clots present within section. Note: units 66 and 67 are lithologically similar.



BOX #: 141

Cores in box
192
193

Loggers:	JCL
Date logged:	11/16/93
Checked by:	MG
Check date:	11/19/94

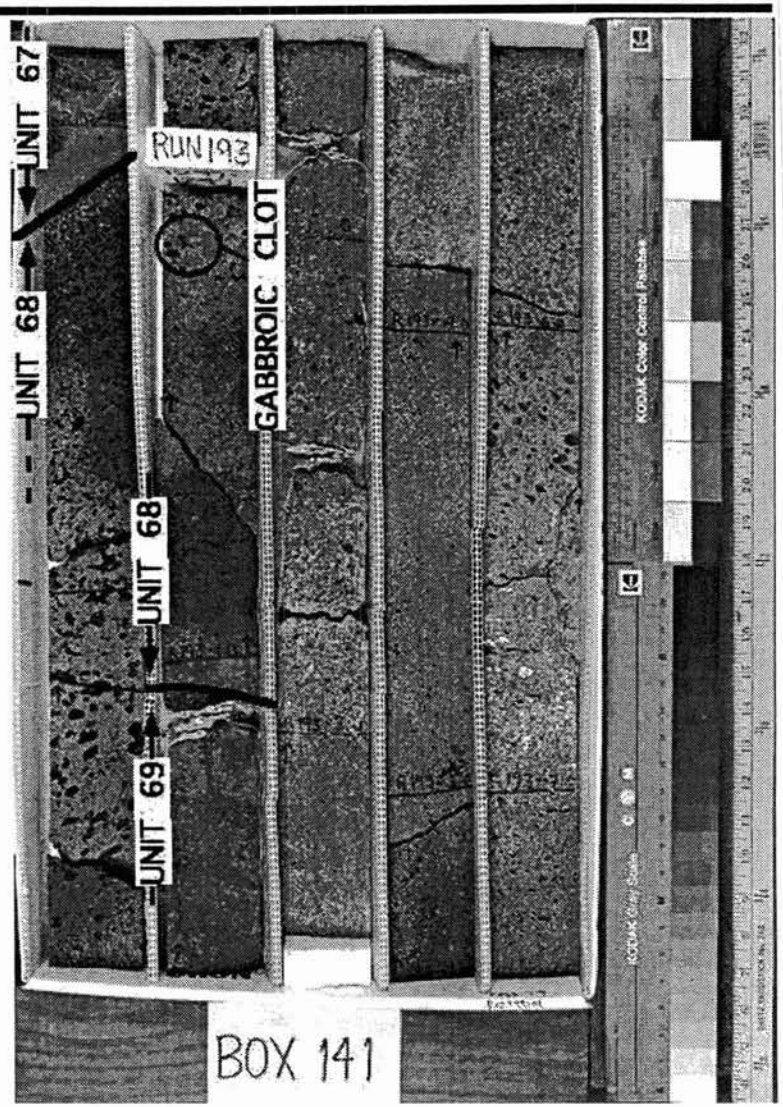
Driller's depth:top [feet]:	1234.9
Driller's depth:bottom [feet]:	1244.4
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately to highly olivine phyric basalt — UNIT #: 68

Contacts: Top (ft): (R 192-8.0-1235.1')(flow contact)
Bottom (ft): (R 193-1.1-1238.3')(flow contact)
Note: a few inches of Unit 67 is present at the top of this box. Orangish soil/ash marks top contact; vesicular zone marks base.
Unit type: massive
Phenocrysts/Clasts:
moderately to highly phyric (2->10%) –
olivine – 9-12% – 2-3 mm – blocky (<3:1:1) –
9% at R192-8.5; 12% at R192-9.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 20-50%, variable – 1-5 mm – – –
30-50% 1-2 mm rounded, inclined elongate vesicles at top grade to larger (5-10 mm), fewer vesicles with depth. Small subrounded vesicles predominate near lower contact.
Alteration: fresh (<2% altered) –
slight red oxidation of groundmass
Veins: none
Fractures: weakly fractured: 5/3 ft
Additional comments:
0.2-0.3 ft red highly oxidized upper contact containing highly vesicular autoliths and 2-10% olivine. Small gabbroic clot at R193-0.2.

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 69

Contacts: Top (ft): (R 193-1.1-1238.3')(flow contact)
Bottom (ft): (R--')(continuous with next box)
highly vesicular brown horizon at R193-1.1 with moderate increase in olivine content below
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-5 mm – equant to blocky –
19% at R193-7.0. Many olivines oxidized to black.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 20-30%, variable – 1-5 mm – – –
20-30% <1 mm sub-vertically elongate vesicles at top grade to 1-5 mm horizontal vesicles with depth (R193-7.0) Some infilling with soft white material from R193-0.7 to 3.0.
Alteration: fresh to slightly (<2-10% altered) –
Veins: none
Fractures: weakly fractured: 7/6 ft; subhorizontal
Additional comments:
Olivines are weathered and oxidized (reddish black to black) from top of unit to R193-3.0.



Box #:	Cores in box
142	193 194

Loggers:	JCL
Date logged:	11/16/93
Checked by:	MG
Check date:	11/19/94

Driller's depth:top [feet]:	1244.4
Driller's depth:bottom [feet]:	1254.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:69

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Red, baked rubble zones at 193-7.5, 193-8.5, 193-9.5, 194-0.5, 194-4.5

Unit type: massive

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-5 mm – blocky (<3:1:1) –
Weathered, oxidized (red to black). 14% at R193-8.5, 14% at R194-6.5.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: 5YR 6/1 light brownish gray – **Structures:** – **Sorting:** –

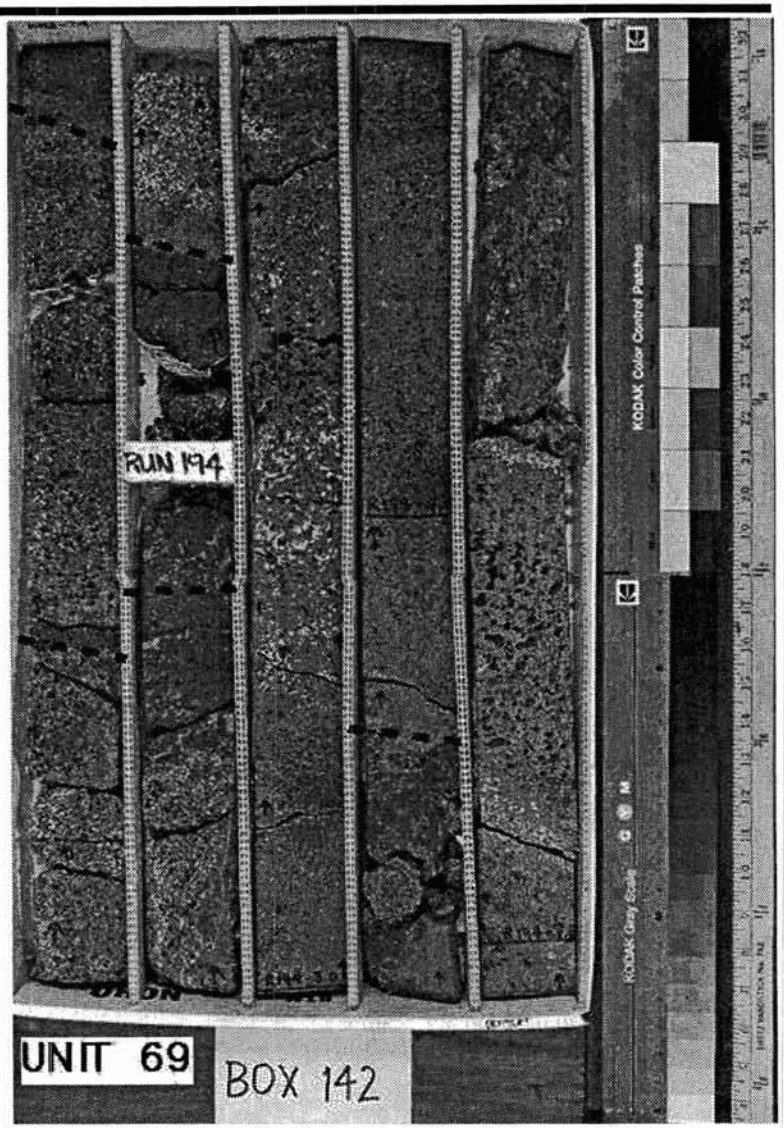
Vesicles: 10-20% – 1-2 mm – rounded – –
Most of the flow is too friable and altered to determine accurately vesicle content and shape. Generally 10-20%, partially infilled with soft white to yellow material.

Alteration: moderately (10-40% altered) –
oxidation of groundmass; partial infilling of vesicles

Veins:

Fractures: weakly fractured, sub-horizontal: 19/10 ft; some rubble zones

Additional comments:
Many thin flow units but no distinct lithologic change. Repeated oscillations of small (<1 mm) to large (1-5 mm) to small vesicles, separated by friable breccia/rubble zones. Smaller vesicles are sub-horizontal and rounded. Larger vesicles are rounded to irregular, subvertical.



Box #: 143

Cores in box
194
195

Loggers: JCL
Date logged: 11/16/93
Checked by: MG
Check date: 11/19/94

Driller's depth:top [feet]: 1254.1
Driller's depth:bottom [feet]: 1263.7
Core type: HQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

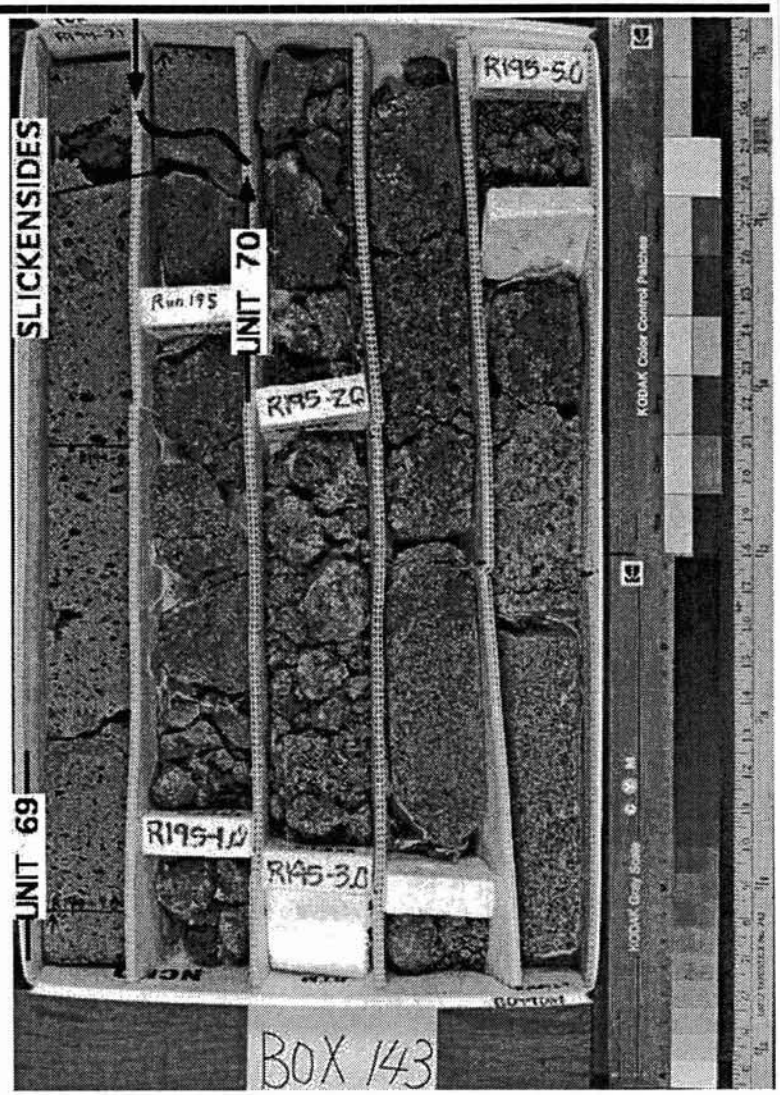
UNIT #: 69

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 194-9.4-1256.6')(flow contact)
red
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-5 mm – blocky (<3:1:1) –
11% at R194-8.6
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – horizontally elongated –
16% at R194-8.2
Alteration: fresh (<2% altered) –
minor oxidation, especially along vesicle surfaces
Veins: none
Fractures: weakly fractured: 2/2 ft
Additional comments:
Fracture at lower contact (R194-9.4) appears to have 60° dip of slickensides.

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 70

Contacts: Top (ft): (R 194-9.4-1256.6')(flow contact)
Bottom (ft): (R--')(continuous with below)
Unit type: massive
aa top
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-30% – 1-2 mm – equant to blocky –
25% at R195-6.5, generally oxidized to black. Olivines are smaller, more numerous than in previous flow.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 6/1 light brownish gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-2 mm – rounded – –
Preferential weathering of groundmass around olivines has obliterated most vesicles - difficult to determine vesicle content.
Alteration: moderately (10-40% altered) –
Some oxidation and clay formation in matrix. Olivines are black along rims.
Veins: none
Fractures: Rubble at top grading to weakly fractured with depth.
Additional comments:



Box #:	Cores in box
144	195 196

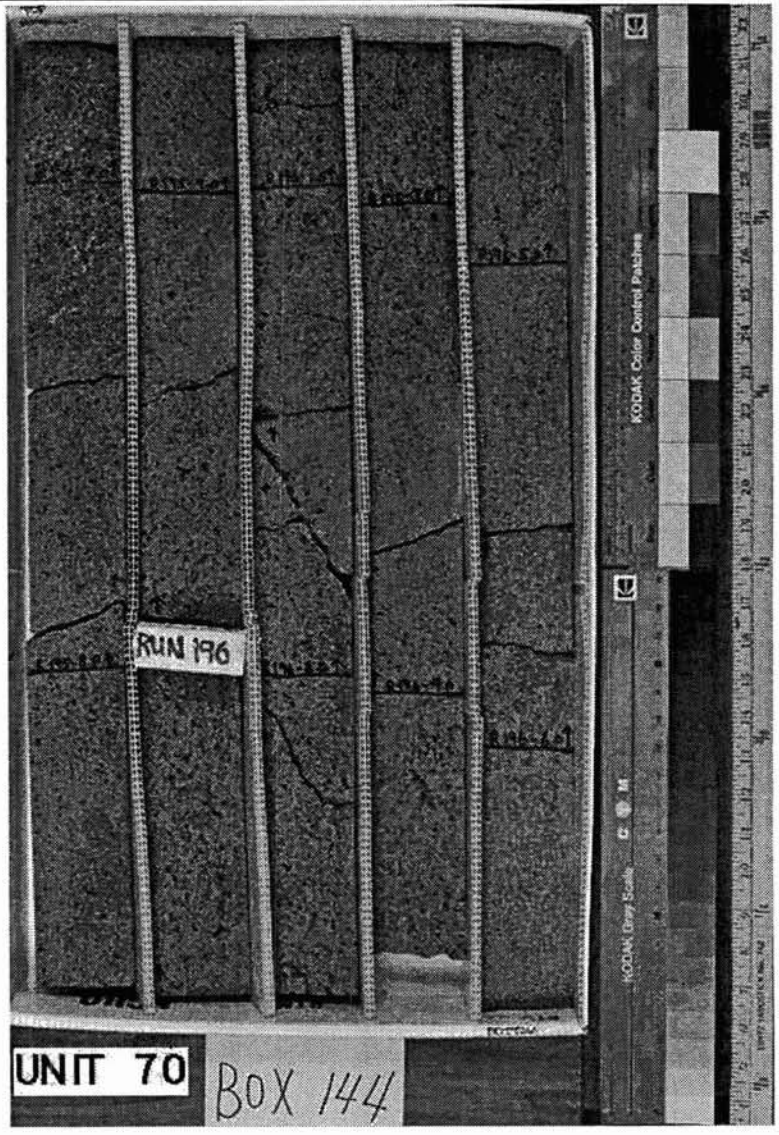
Loggers:	JCL
Date logged:	11/16/93
Checked by:	MG
Check date:	11/19/94

Driller's depth:top [feet]:	1263.7
Driller's depth:bottom [feet]:	1270.4
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:70

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-5 mm – blocky (<3:1:1) –
19% at R195-7.7, 15% at R196-6.5. Weathered, oxidized (red to black) near top, becoming fresher with depth. Some small spinel inclusions.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – irregular – vertically elongated –
Alteration: fresh (<2% altered) –
minor oxidation of olivines and groundmass, decreasing with depth
Veins: none
Fractures: Weakly fractured: 13/10 ft; sub-horizontal. A few have soft white coating.
Additional comments:



Box #: 145

Cores in box
196
197

Loggers: JCL
Date logged: 11/16/93
Checked by: MG
Check date: 11/19/94

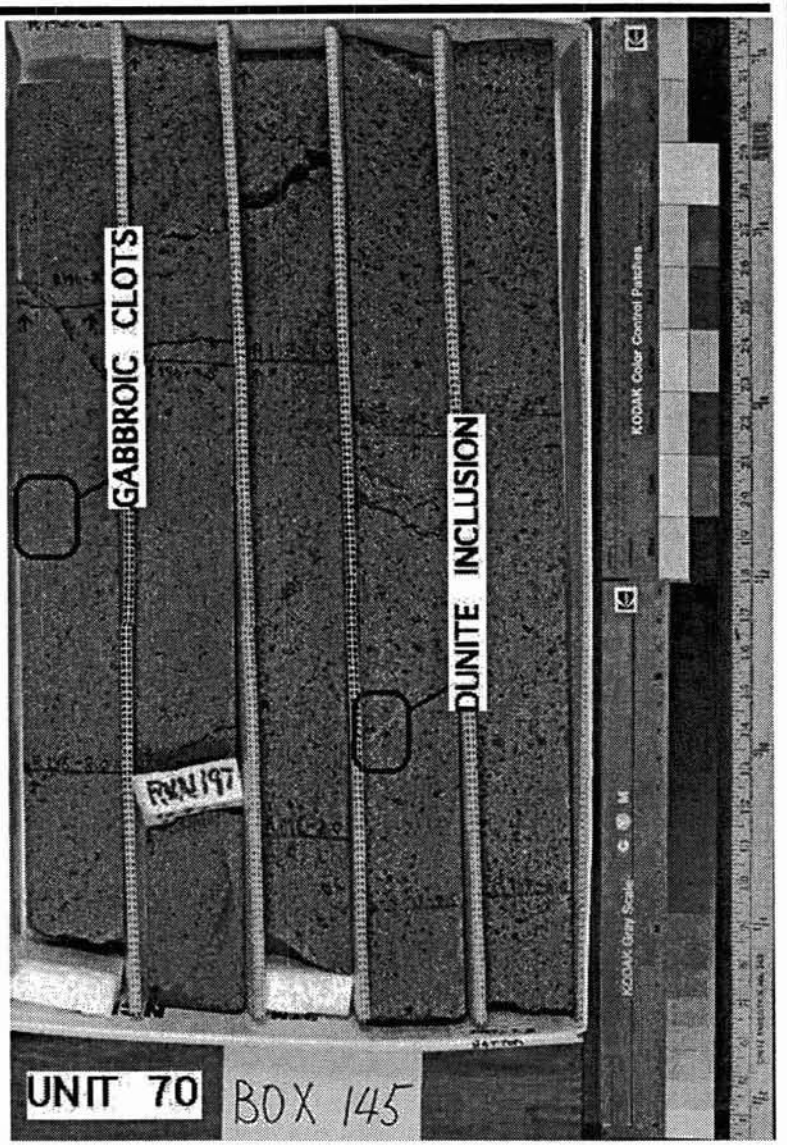
Driller's depth:top [feet]: 1270.4
Driller's depth:bottom [feet]: 1284.3
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:70

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-30% – 1-5 mm – blocky (<3:1:1) –
24% at R196-7.6. Olivines become more oxidized with depth.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 6/1 light olive gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – rounded – equant to horizontally elongated –
Alteration: fresh (<2% altered) –
Oxidation of olivines increases with depth.
Veins:
Fractures: weakly fractured: 8/10 ft; sub-horizontal
Additional comments:
Microgabbroic clots and dunitic inclusions, <1 to 2 cm, found throughout flow.



Box #:	Cores in box
146	197 198

Loggers:	MBB
Date logged:	11/16/93
Checked by:	MG
Check date:	11/19/94

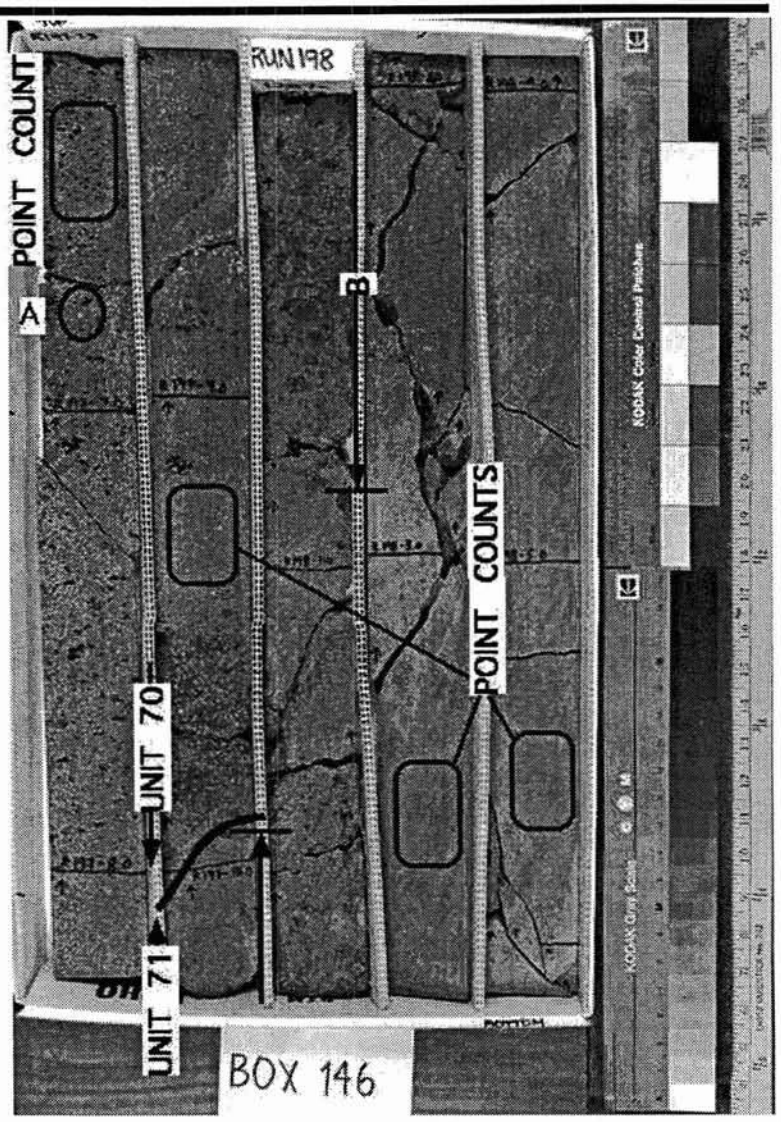
Driller's depth:top [feet]:	1284.3
Driller's depth:bottom [feet]:	1292.3
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 70

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R197-10.0-1286.9')(flow contact)
Flow contact defined by oxidation zone at the top of the lower flow, clasts from the lower flow within the basalt zone of the upper flow and a change in lithology.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~35% – 2-5 mm – equant –
34% at R197-6.5; 37% at R197-9.3; volume% of olivine phenocrysts decreases slightly up section. Olivines contain spinel inclusions and are present as crystal clots. Olivine alteration consists of minor iddingsite as well as iridescent (MnO?) coatings on some grains.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <10% – 1-10 mm – rounded to subangular – equant to horizontally elongate –
Small (<1 mm) vesicles tend to be more rounded and equant than the larger vesicles. Below R197-8.0 vesicle volume% decreases to <2%.
Alteration: slightly to moderately (2-40% altered) –
Extent of groundmass oxidation increases toward contact.
Veins: none
Fractures: Weakly fractured: 4/3.7 ft; soft white to yellow material (clay?) coating some fractures.
Additional comments:
Color determined on a relatively fresh piece of core. see photo: "A" = location of non-vesicular pale-green inclusion

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 71

Contacts: Top (ft): (R 197-10.0-1286.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 description for a description of the flow contact.
Unit type: aa(?) to massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 2-4 mm – equant –
Within oxidized zone near the contact, olivines are oxidized and partially iddingsitized.
plagioclase – <<1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <2% – <2 mm – sub-angular – elongate –
Vast majority of vesicles have very high aspect ratios and random orientations; vesicles in the clasts (region labeled "B" on photo) are more equant.
Alteration: fresh to highly (<2-80% altered) –
Clasts and matrix are highly oxidized within 1.3 ft of the contact.
Veins: none
Fractures: weakly fractured: 17/6.3 ft
Additional comments:
"B" = zone of oxidized, angular basalt clasts in an oxidized/weathered friable matrix which grades into essentially unoxidized massive material over a distance of ~3 ft.



Box #: 147

Cores in box
198
199

Loggers: JCL
Date logged: 11/16/93
Checked by: MG
Check date: 11/19/94

Driller's depth:top [feet]: 1292.3
Driller's depth:bottom [feet]: 1302.0
Core type: HQ

Units in box: 2

BOX UNIT 1: sparsely olivine phyric basalt

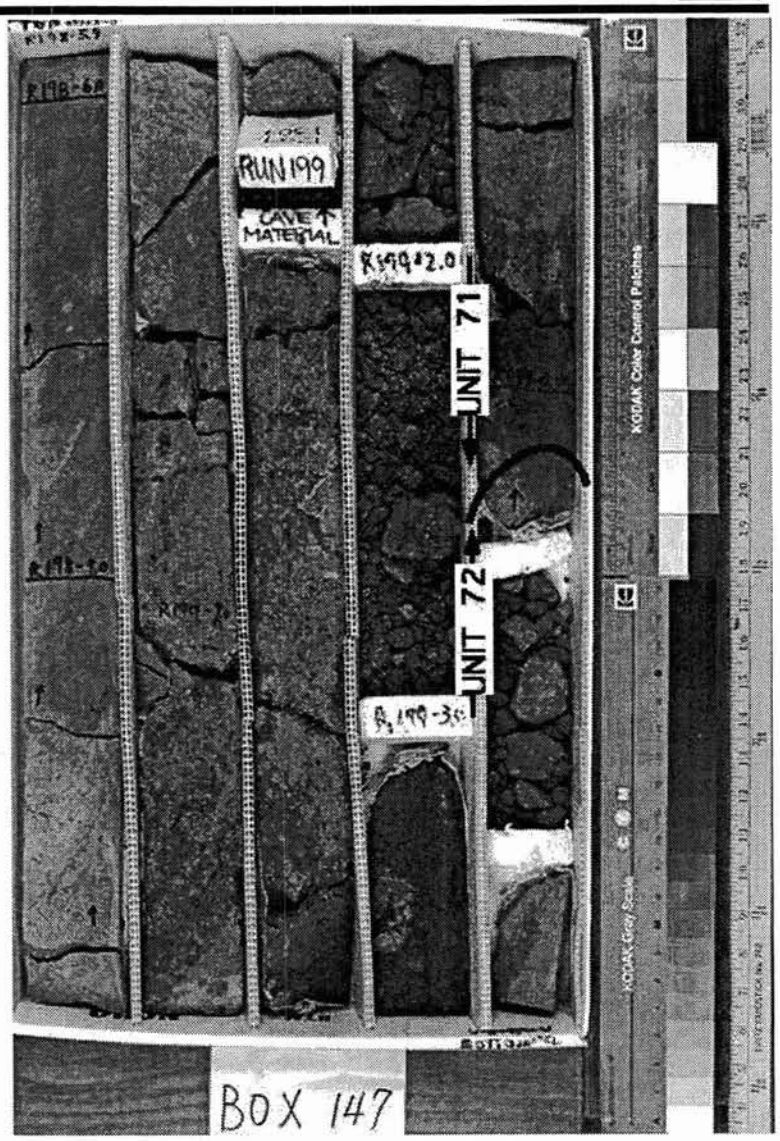
UNIT #: 71

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R199-4.2-1301.4')(flow contact)
red rubbly contact at base
Unit type: massive
aa-type brecciated lower contact
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-5 mm – blocky (<3:1:1) –
1-2% at R198-6.5
plagioclase – <<1% – <1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% – <1 mm – irregular to sub-rounded – equant to horizontally elongated –
Very small (<1 mm), equant micro-vesicles with some sub-horizontal striations or vesicle trains. Occasional larger (1-5 mm) irregular to sub-horizontal. vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 14/6 ft. Becomes highly fractured/rubbly at lower contact.
Additional comments:

BOX UNIT 2: sparsely olivine phyric basalt

UNIT #: 72

Contacts: Top (ft): (R 199-4.2-1301.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red rubbly top
Unit type: rubble grading to massive
aa top
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-3 mm – blocky (<3:1:1) –
abundance measured in larger, fresher clasts
– – – –
– – – –
Groundmass/Matrix: subrounded microcrystalline breccia –
Color: 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1-2 mm – – –
highly variable
Alteration: highly (40-80% altered) – clay
substantial oxidation of flow top
Veins: none
Fractures: highly fractured to rubble
Additional comments:



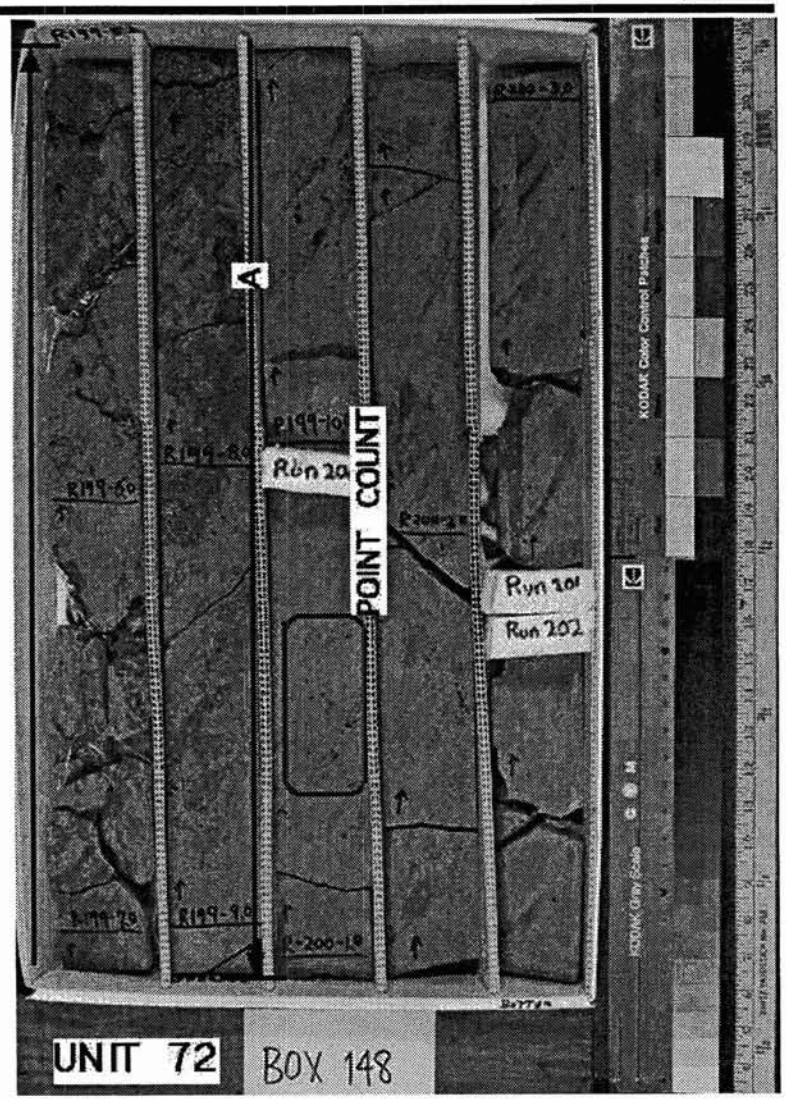
Box #:	Cores in box
148	199 202 200 201

Loggers:	MBB
Date logged:	11/16/93
Checked by:	MG
Check date:	11/19/94

Driller's depth:top [feet]:	1302.0
Driller's depth:bottom [feet]:	1312.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: sparsely olivine phyric basalt **UNIT #:72**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa to massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 2-5 mm – equant –
Rare spinel inclusions in the olivines; grains are partially oxidized/iddingsitized within oxidized zone (labeled "A" on photo), unaltered below this zone.
plagioclase – <<1% – <1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: <2% – <1 to 4 mm – subangular to angular – equant to elongate –
Clasts in the oxidized zone can be more vesicular (<20%) than the massive portion of the core; hard, white spheroids (silica precipitates?) on the surfaces of some vesicles.
Alteration: fresh (<2% altered) below R200-0.0 –
Core is highly oxidized in the region between R199-5.0 to R199-9.0; groundmass oxidation decreases over this interval.
Veins: none
Fractures: Weakly fractured: 13/8.7 ft; doesn't include highly fractured zone between R199-6.0 to R199-7.0.
Additional comments:
see photo: "A" = zone of less oxidized angular clasts in a more oxidized friable matrix (no obvious clay development); grades into massive unoxidized material by the bottom of the run (R199-10.0); rare small (3-5 mm) gabbroic clots



Box #: 149

Cores in box
202
203

Loggers: JCL
Date logged: 11/16/93
Checked by: MG
Check date: 11/19/94

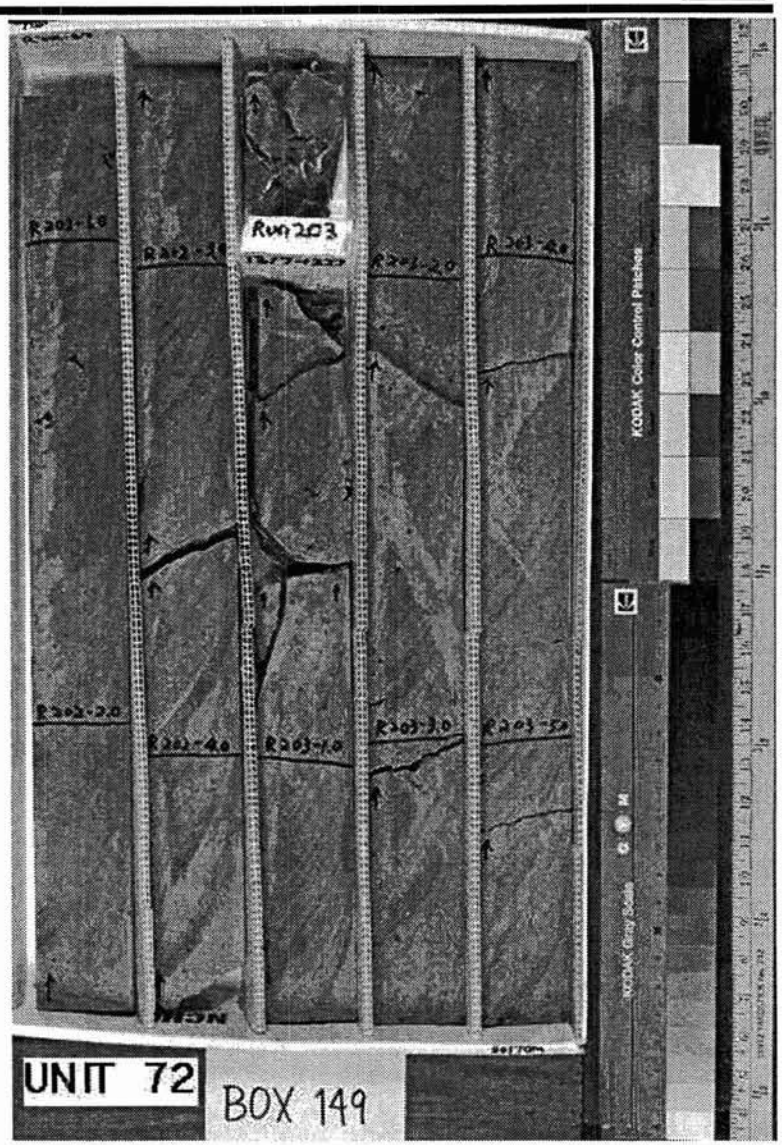
Driller's depth:top [feet]: 1312.7
Driller's depth:bottom [feet]: 1322.6
Core type: HQ

Units in box: 1

BOX UNIT 1: sparsely to moderately olivine phyric basalt

UNIT #:72

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
sparsely to moderately phyric (1-10%) –
olivine – 1-3% – – –
1-2% at R202-2.5, 3% at R203-5.3
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 2-6 mm – irregular – variably elongate–
Some sub-horizontal trains of micro-vesicles. Larger vesicles form sub-horizontal to sub-vertical trains. Some larger vesicles have sugary interior with soft white hexagonal sub-mm crystals.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 11/10 ft. Sub-horizontal (mechanical?) fractures. Some have dark brown to black surfaces, some have dendritic (biological?) appearance.
Additional comments:
rare, small (~3-5 mm) open-textured gabbroic inclusions



Box #:	Cores in box
150	203 204

Loggers:	JCL
Date logged:	11/16/93
Checked by:	MG
Check date:	11/19/94

Driller's depth:top [feet]:	1322.6
Driller's depth:bottom [feet]:	1332.2
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt

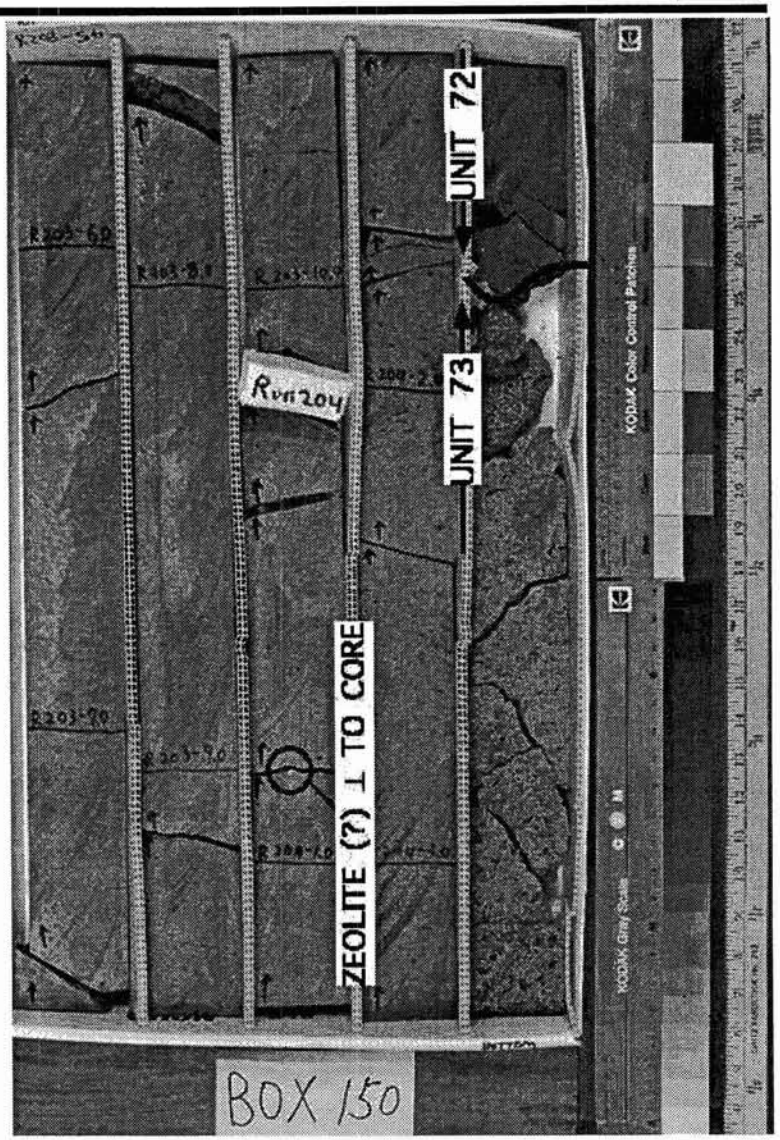
UNIT #: 72

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R203-3.8-1320.8')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-3% – 1-3 mm – blocky (<3:1:1) –
2% at R203-6.2, 3% at R204-3.0
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – <1 mm – rounded – horizontally elongated–
Sub-horizontal micro-vesicles striations grade into larger subhorizontal vesicle trains (1-3 mm) with depth.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 10/6 ft; subhorizontal
Additional comments:
R204-0.8: 2.5 cm white material infilling vug (?), crystalline, softer than knife, not calcite - possibly zeolite?

BOX UNIT 2: moderately olivine phyric basalt

UNIT #: 73

Contacts: Top (ft): (R 203-3.8-1320.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 1-3 mm – blocky (<3:1:1) –
iddingsitized - weathered red
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 6/1 light brownish gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – irregular – sub-horizontally elongated–
Alteration: fresh (<2% altered) –
some oxidation of groundmass
Veins: none
Fractures: weakly fractured: 5/1.5 ft
Additional comments:



Box #: 151

Cores in box
204
205

Loggers: MBB
Date logged: 11/17/93
Checked by: MG
Check date: 11/30/93

Driller's depth:top [feet]: 1332.2
Driller's depth:bottom [feet]: 1341.8
Core type: HQ

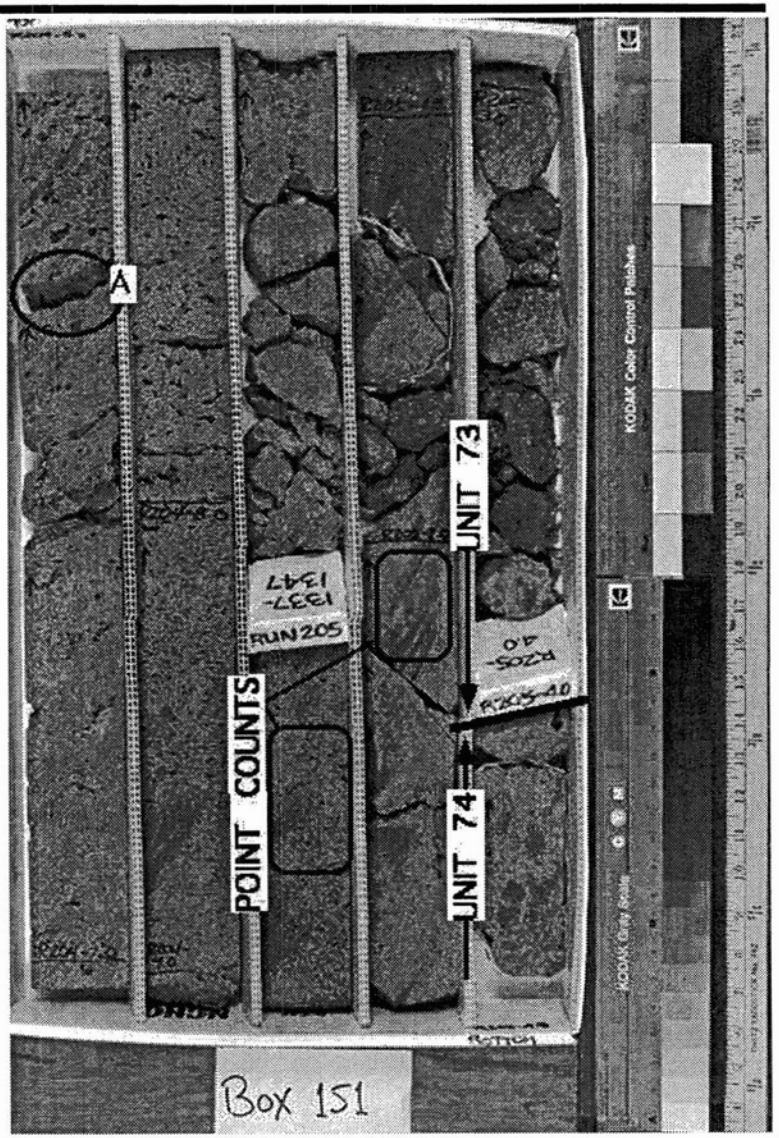
Units in box: 2

BOX UNIT 1: aphyric to moderately olivine phyric basalt — UNIT #: 73

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R205-4.2-1341.4')(flow contact)
Flow contact defined by rubbly, more vesicular zone (relative to material further up section) in upper flow and angular oxidized clasts in an oxidized/weathered matrix at the top of the lower flow.
Unit type: massive
Phenocrysts/Clasts:
aphyric to moderately phyric (<1-10%) –
olivine – <1-4% – 1-2 mm – equant –
<1% at R205-0.4; 4% at R205-2.0. Olivine abundance is variable, some grains are up to 4 mm in longest dimension, no spinel inclusions observed in olivine phenocrysts. See alteration comments for discussion of olivines.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 - medium gray – **Structures:** – **Sorting:** –
Vesicles: 3-15% – 1-10 mm – sub-angular – subhorizontally elongate –
Vesicle volume% and size decrease between R204-5.2 to R205-2.0.
Alteration: slightly to highly (2-80% altered) –
From R204-5.2 to R205-0.0 groundmass is oxidized (reddish tint); olivines are almost completely oxidized and/or iddingsitized. Below R205-0.0, olivines are partially altered; groundmass has faint reddish tint.
Veins: none
Fractures: weakly to highly fractured (see photo for locations of rubbly zones): 9/6.3 ft; reddish coatings on some fractures (clays/iron-oxides)
Additional comments:
see photo: "A" = slickensides on fracture surfaces

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 74

Contacts: Top (ft): (R 205-4.2-1341.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
oxidized angular clasts in an oxidized/weathered matrix
Unit type: aa
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant –
Olivines in the clasts are almost completely oxidized so it is difficult to estimate their percentage.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 4/2 grayish red – **Structures:** – **Sorting:** –
Vesicles: 3-20% – 1-2 mm – subrounded to subangular – equant –
Vesicle content of clasts is highly variable.
Alteration: very highly (80-95% altered) - oxidized –
Veins: none
Fractures: not applicable (see photo)
Additional comments:



Box #:	Cores in box
152	205 206 207

Loggers:	BR
Date logged:	11/17/93
Checked by:	MG
Check date:	11/29/93

Driller's depth:top [feet]:	1341.8
Driller's depth:bottom [feet]:	1354.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: sparsely plagioclase-olivine phyric basalt — UNIT #: 74

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R206-0.5-1347.5')(flow contact)
lithology change to more olivine phyric; contact poorly recovered (rubble zone)

Unit type: aa
rubbly to massive aa flow

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant –
200 pts counted @ R205-8.5
plagioclase – <1% – – tabular –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N7 light gray – **Structures:** – **Sorting:** –

Vesicles: 5-10% – 1-3 mm – sub-rounded – elongate to equant –
vesicle abundance increases to end of R205 and in broken basalt from here to R208-0.8

Alteration: slightly to moderately (2-40% altered) –
highly (oxidized) clasts to R205-7.0

Veins: none

Fractures: Rubble from R205-4.8 to 6.6; weakly fractured from R205-7.0 to R206-0.0; rubble from R206-0.0 to 0.8.

Additional comments:
Xenoliths (5 mm) at R205-8.5 (plagioclase,clinopyroxene?) and 8.7 (dunite?). Brecciated, more oxidized flow top? More oxidized material in white clay matrix down to R205-7.0. Sheared from R205-7.0 to 8.0.

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 75

Contacts: Top (ft): (R 206-0.5-1347.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
rubbly top

Phenocrysts/Clasts:
moderately phyric (5-10%) –
olivine – 5-10% – 1-2 mm – equant –
seen only in clasts
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N7 light gray (clasts); 5RP6 pale red purple (matrix) – **Structures:** – **Sorting:** –

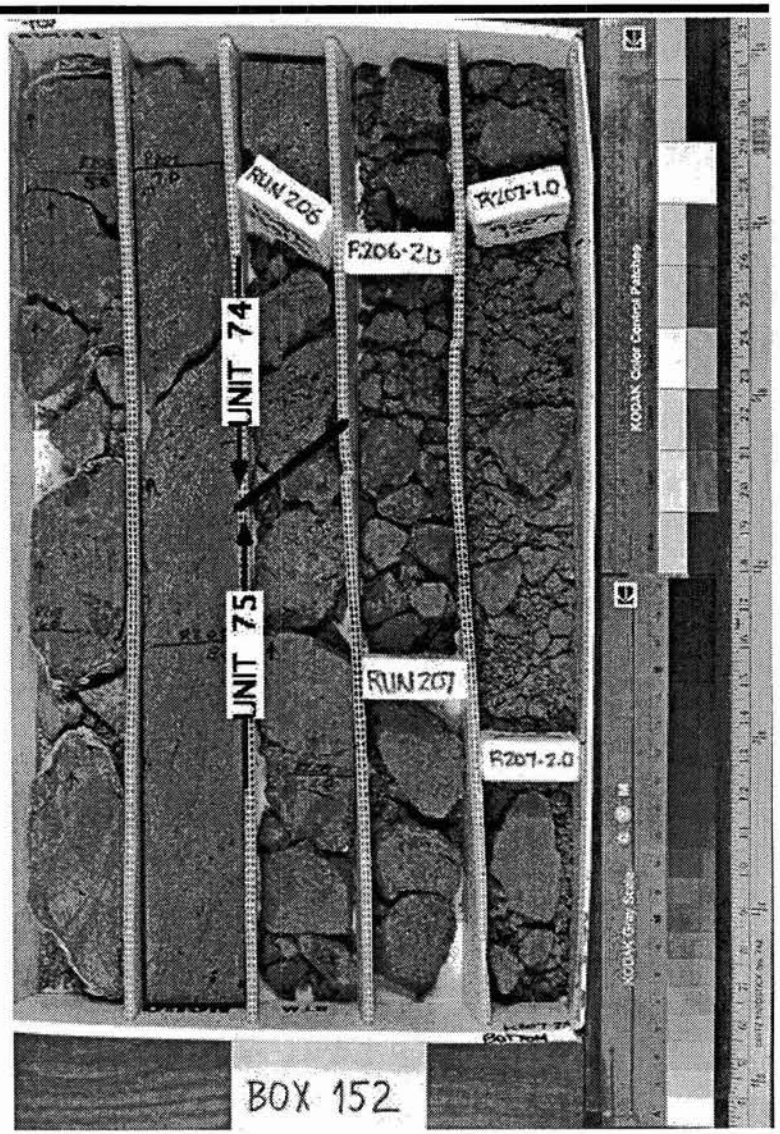
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant –
highly variable on clast type in rubble

Alteration: moderately to highly (10-80% altered) –

Veins: none

Fractures: highly fractured, core is essentially broken rubble

Additional comments:



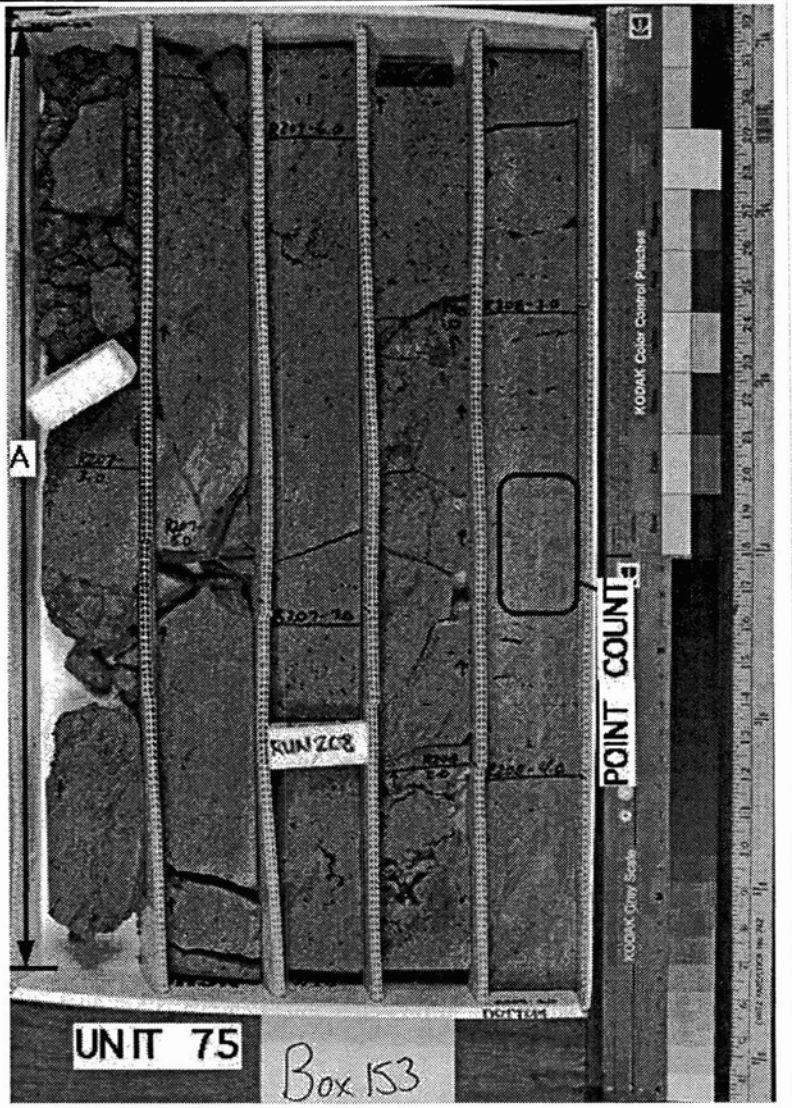
Box #:	Cores in box
153	207 208

Loggers:	MBB
Date logged:	11/17/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1354.0
Driller's depth:bottom [feet]:	1363.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:75**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa to massive
massive material begins at ~R207-4.5
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5% – 2-3 mm – equant –
5% at R208-3.5; above R208-2.0 olivines are almost completely oxidized (some iddingsite); below this level, olivines have minor iridescent coatings and show some iddingsite development
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 medium light gray – **Structures:** – **Sorting:** –
Vesicles: <2-10% – <1-10 mm – subangular – equant to horizontally elongate –
Smaller more equant vesicles occur in the clasts; the elongate vesicles are present in the massive portion of the unit.
Alteration: fresh to highly (<2-80% altered) –
no apparent oxidation below R208-2.5
Veins: none
Fractures: weakly fractured: 14/7.6 ft; measured from R207-4.0. Soft white/yellow material (clay?) partially coating some fracture surfaces.
Additional comments:
"A" = part of an aa flow top; consists of partially oxidized subrounded to subangular basalt clasts in a more oxidized matrix. Degree of oxidation decreases down section; groundmass is only slightly oxidized by R207-4.5.



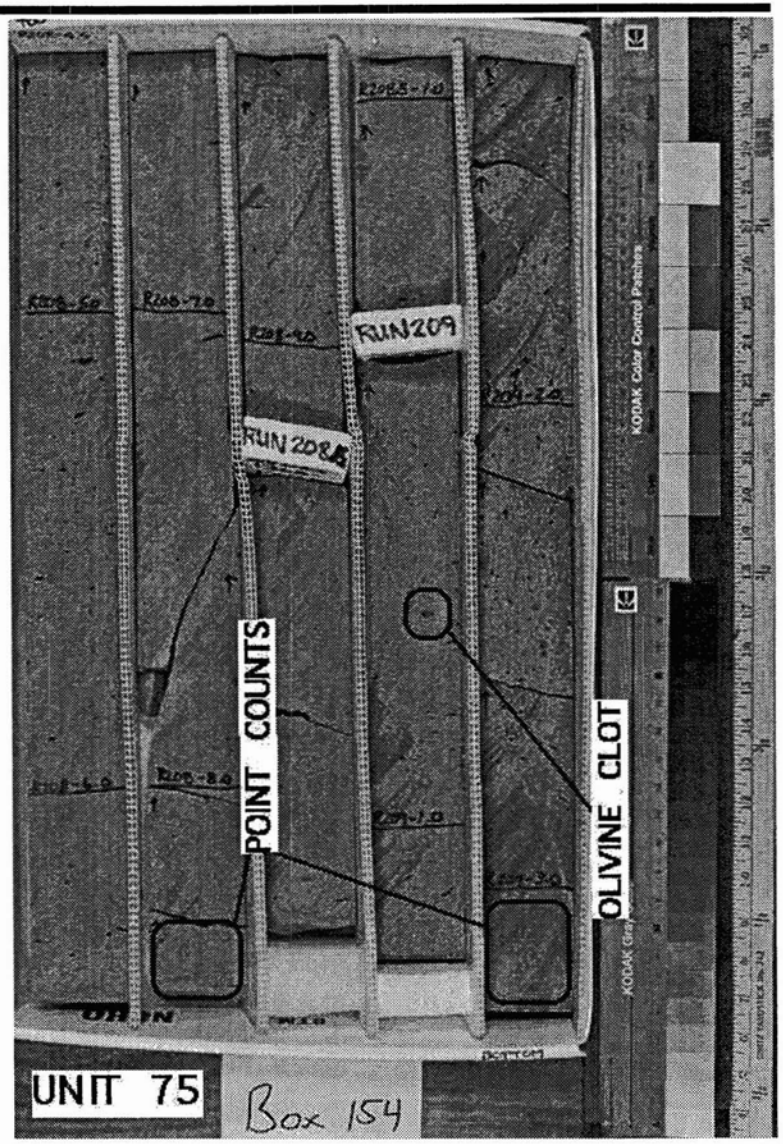
Box #:	Cores in box
154	208 208.5 209

Loggers:	BR
Date logged:	11/17/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1363.5
Driller's depth:bottom [feet]:	1372.8
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:75**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
massive aa flow continuous with previous box
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 2 mm – equant –
8% (R208-8.4), 10% (R209-3.1); scattered clusters of olivine up to 5 mm; olivine % increases towards bottom of core
plagioclase – <1% – 1-2 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N7 light gray – **Structures:** – **Sorting:** –
Vesicles: 3-5% – 1-2 mm – sub-rounded – equant–
5-10 mm vesicles scattered, subrounded, elongate and angled at 30% in Run 209
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 7/10 ft
Additional comments:
rare, small (3-6 mm) gabbroic inclusions



Box #: 155

Cores in box
209
210

Loggers: MBB
Date logged: 11/17/93
Checked by: MG
Check date: 11/30/93

Driller's depth:top [feet]: 1372.8
Driller's depth:bottom [feet]: 1381.5
Core type: HQ

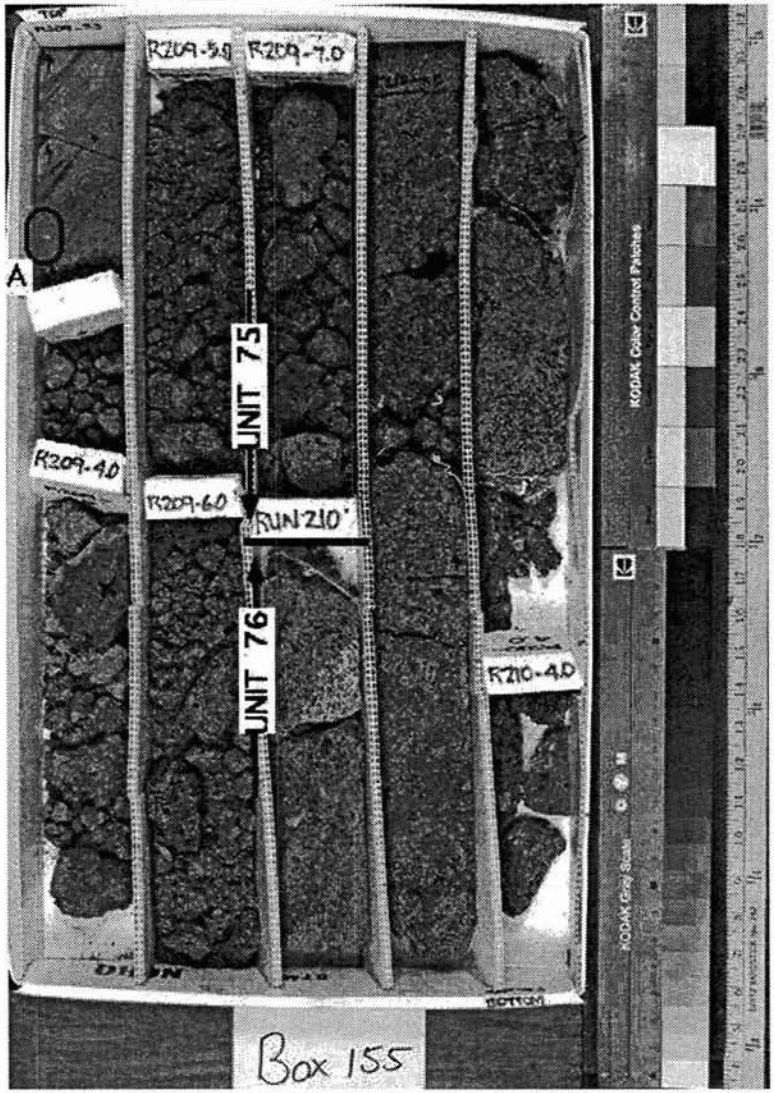
Units in box: 2

BOX UNIT 1: moderately plagioclase-olivine phyric basalt — UNIT #: 75

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R210-0.0-1377.0')(flow contact)
Flow contact defined by lithologic change from a moderately to a highly olivine phyric basalt.
Unit type: massive to rubbly
from R209-3.8 to R210-0.0, subangular to angular basaltic clasts of varying degrees of oxidation set in a friable oxidized matrix
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 10% – 2-3 mm – equant –
10% at R209-3.4; many of the olivine phenocrysts are oxidized and/or altered to iddingsite
plagioclase – <1% – ~1 mm – tabular (>3:1:1) –
rare xenocryst at R209-3.7 ("A" on photo)
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 medium light gray – **Structures:** – **Sorting:** –
Vesicles: <2-20% – 1-5 mm – sub-angular – elongate –
Alteration: slightly to moderately (2-40% altered) –
proportion of groundmass (i.e., rubbly material) that is oxidized increases toward contact
Veins: none
Fractures: weakly to rubbly: 1/0.5 ft; see photo for location of rubbly zones
Additional comments:

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 76

Contacts: Top (ft): (R 210-0.0-1377.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Flow contact defined by change in unit type and lithology.
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25% – 3-5 mm – equant –
25% at R210-0.7; olivine phenocrysts contain spinel inclusions and occur as crystal clots; olivines are partially oxidized and iddingsitized.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 4/6 to 10R 4/2 – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 2-4 mm – rounded to subangular – equant to elongate –
Alteration: slightly to very highly (2-95% altered) –
Veins: none
Fractures: Unit is friable and in some regions core recovery was poor (see photo).
Additional comments:



Box #:	Cores in box
156	210 211 212

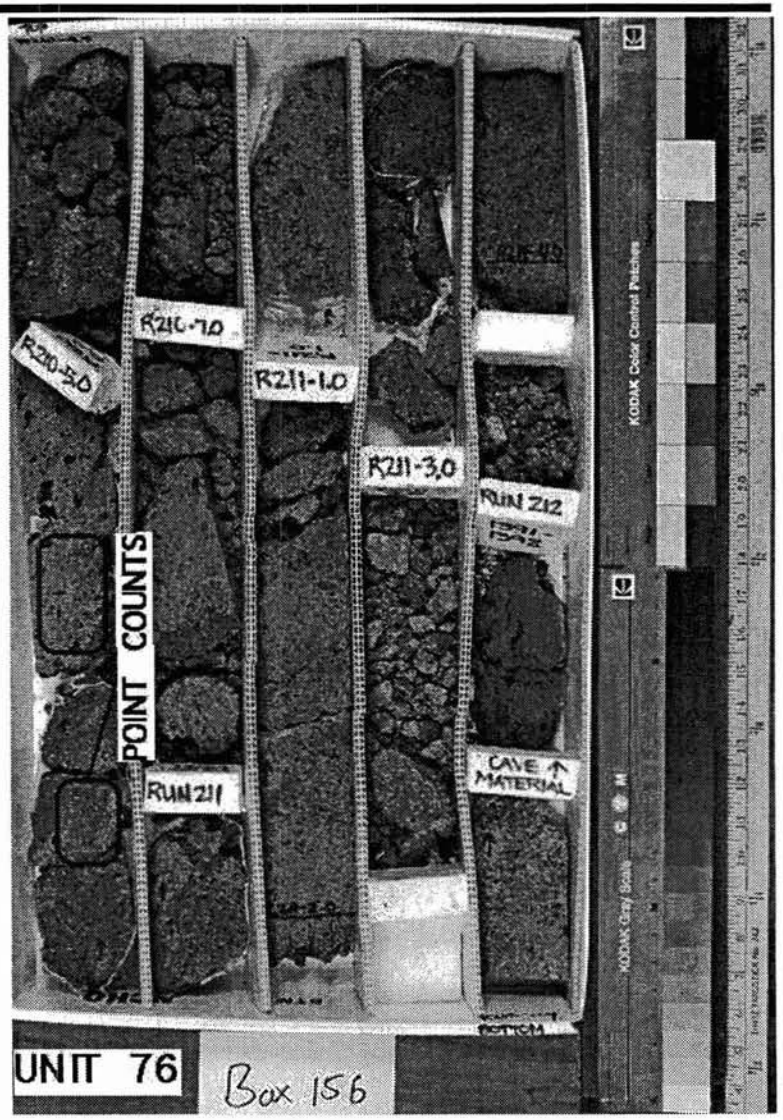
Loggers:	BR
Date logged:	11/17/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1381.5
Driller's depth:bottom [feet]:	1391.4
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:76

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubbly to partly massive flow, porphyritic
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-28% – 2-5 mm – equant – hematite
2-5 mm, avg. 3 mm, 20% (point count 1), 28% (point count 2)
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 to N6, light to medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – variable – sub-rounded – equant–
R210-5.0 to -5.5 contains large subrounded vesicles 2-20 mm, occasionally elongate. Rest of rock has narrow angular to subangular <1 mm clay-lined vesicles.
Alteration: slightly to moderately (2-40% altered) –
Veins: none
Fractures: initial 0.5' and R211-3.0 to -3.8 rubbly; 7/10 ft
Additional comments:
caved sand at start of run 212



Box #: 157

Cores in box
212
213

Loggers: JCL
Date logged: 11/17/93
Checked by: MG
Check date: 11/30/93

Driller's depth:top [feet]: 1391.4
Driller's depth:bottom [feet]: 1398.9
Core type: HQ
Units in box: 3

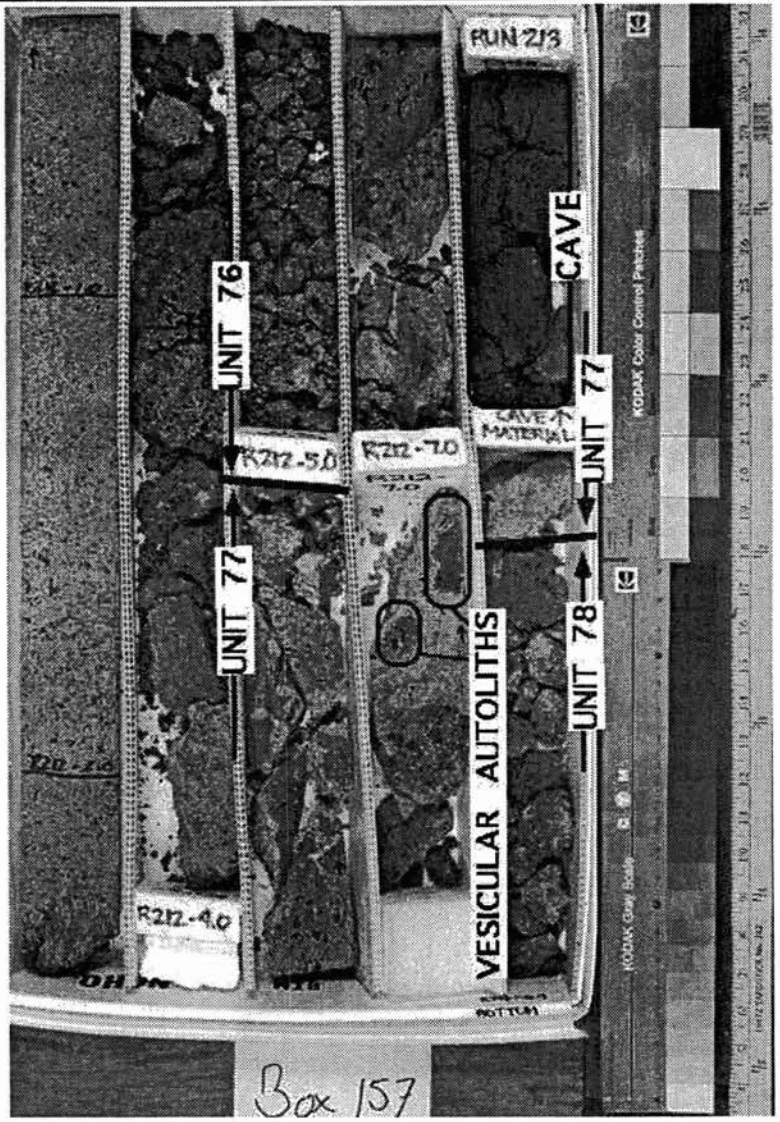
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 76

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R212-5.0-1396.0')(flow contact)
rubbly zone with sharp decrease in olivine content in lower unit - difficult to pinpoint exact contact depth (R212-4.0 to 5.0).
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25-35% – 1-5 mm – blocky (<3:1:1) –
30% at R212-1.8; multi-grain clusters
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – irregular – –
increasing towards base
Alteration: fresh (<2% altered) –
oxidized at base of flow
Veins:
Fractures: weakly fractured grading to rubble near lower contact of oxidized breccia
Additional comments:

BOX UNIT 2: sparsely to moderately plagioclase-olivine phyric basalt — UNIT #: 77

Contacts: Top (ft): (R 212-5.0-1396.0')(flow contact)
Bottom (ft): (R213-0.1-1398.8')(flow contact)
Unit type: aa
Phenocrysts/Clasts:
sparsely to moderately phyric (1-10%) –
olivine – 1-3% – 1-2 mm – blocky (<3:1:1) –
iddingsitized along rims and fractures
plagioclase – <1% – 1-2 mm – blocky (<3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 6/1 light brownish gray – **Structures:** – **Sorting:** –
Vesicles: 5-20% – 1-5 mm – irregular – sub-vertically elongated –
Alteration: slightly to moderately (2-40% altered) –
oxidation of groundmass and weathering/oxidation of olivines
Veins:
Fractures: highly fractured/rubble
Additional comments:
Sandy cave material at the top of Run 213. Some highly vesicular, oxidized autoliths between R212-7.0 and R213-0.0.

BOX 157 CONTINUED ON NEXT PAGE



Box #:	Cores in box
157	212 213

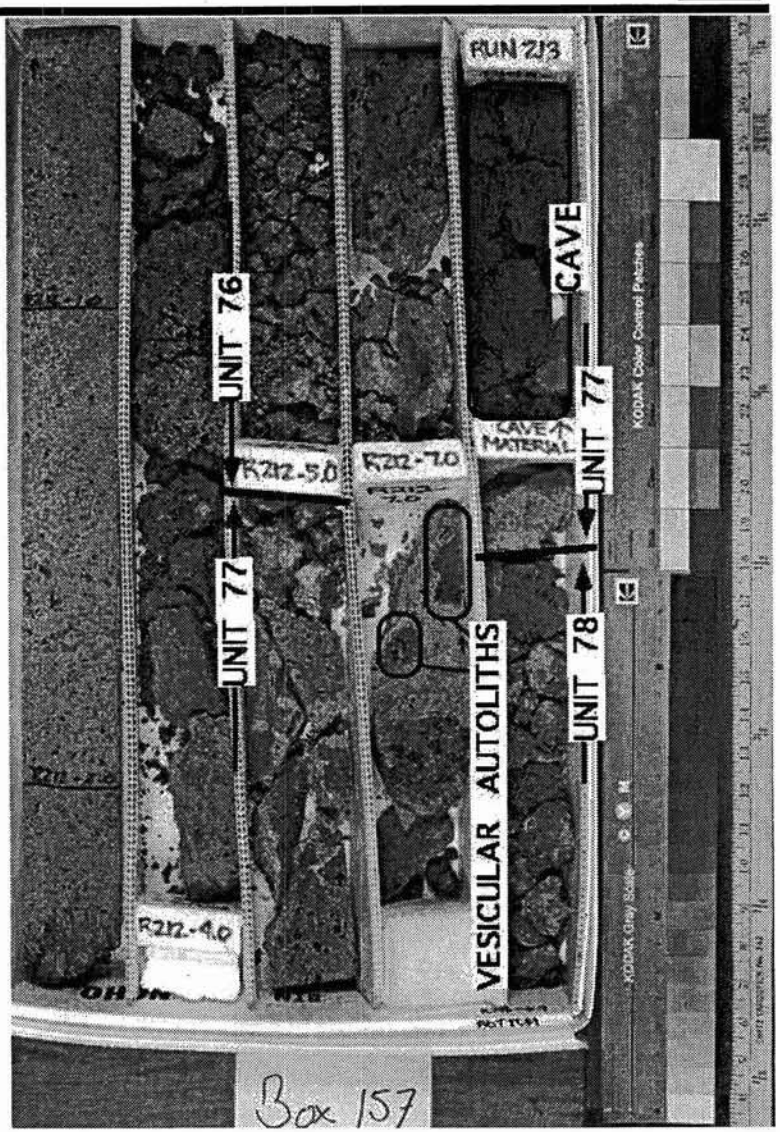
Loggers:	JCL
Date logged:	11/17/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1391.4
Driller's depth:bottom [feet]:	1398.9
Core type:	HQ
Units in box:	3

BOX UNIT 3: highly olivine phyric basalt

Contacts: Top (ft): (R 213-0.1-1398.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-4 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR2/2 grayish brown– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – sub-angular – equant–
Alteration: highly (40-80% altered) –
Veins:
Fractures: rubble only
Additional comments:

UNIT #: 78



Box #:	Cores in box
158	213 214

Loggers:	MBB
Date logged:	11/18/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1398.9
Driller's depth:bottom [feet]:	1407.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt **UNIT #:78**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
From R213-0.9 to R213-5.0 the core consists of relatively unweathered/oxidized subangular/angular basaltic clasts set in an oxidized friable matrix; below R213-5.0 the core becomes massive.

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 2-4 mm – equant –
2% at R214-0.6; 9% at R214-2.8; olivine phenocrysts are inhomogeneously distributed. Rare spinel inclusions; rare crystal clots up to 8 mm in longest dimension. Olivines are generally unaltered in massive portion of the unit, extensively oxidized and iddingsitized in the clast-rich portion of the unit.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N6 medium light gray (fresh piece) – **Structures:** – **Sorting:** –

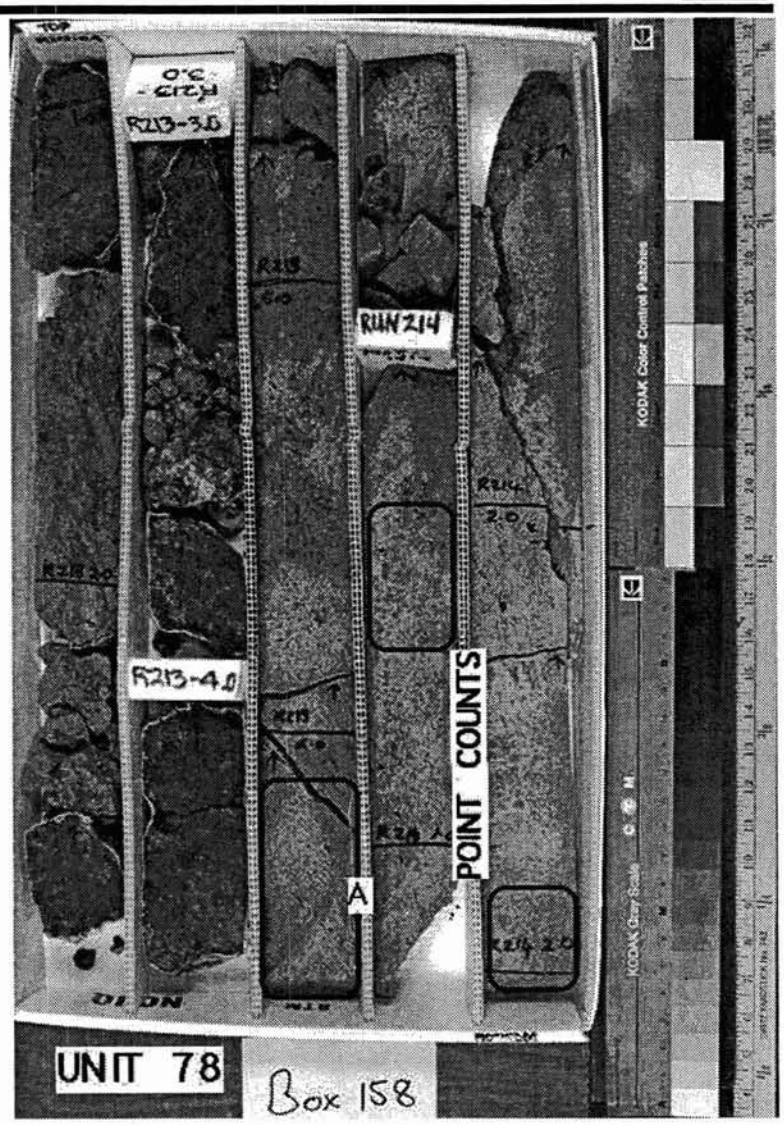
Vesicles: 3-10% – 1-5 mm – subangular to angular – equant to highly elongate –
Vesicles in clasts are less elongate than those in the massive portion of the unit.

Alteration: fresh to moderately (<2-40% altered) –
Alteration consists of oxidation of the friable matrix in the interval R213-0.9 to R213-5.0.

Veins: none

Fractures: Above R213-4.0, material is relatively rubbly; below that depth core is weakly fractured (12/6.3 ft).

Additional comments:
see photo: "A" = zone of highly sheared subvertical vesicle trains



Box #:	Cores in box
159	214 215

Loggers:	MG
Date logged:	11/18/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1407.1
Driller's depth:bottom [feet]:	1417.4
Core type:	HQ
Units in box:	3

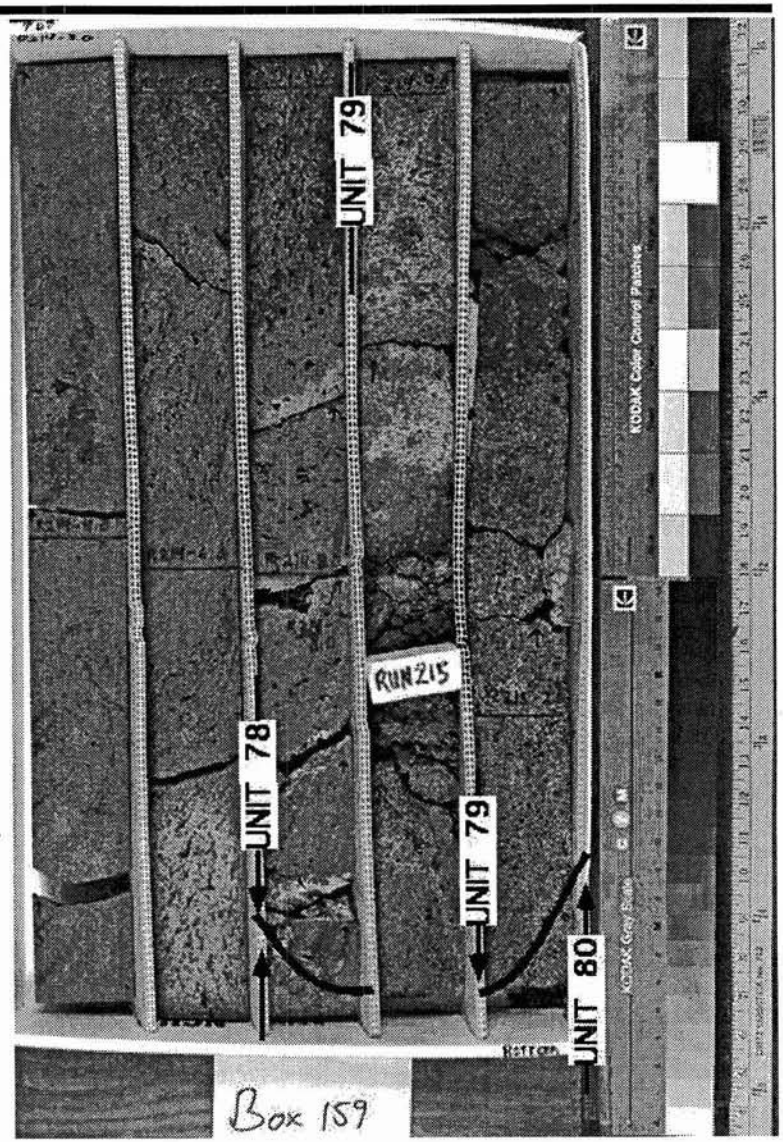
BOX UNIT 1: moderately olivine phyric basalt **UNIT #: 78**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R214-8.8-1414.6')(flow contact)
red, baked rubbly top on flow beneath this unit
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 2-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% to 5-10% – bimodal – sub-angular – inclined –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 7/6 ft
Additional comments:

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 79**

Contacts: Top (ft): (R 214-8.8-1414.6')(flow contact)
Bottom (ft): (R215-2.5-1418.4')(flow contact)
red baked contacts
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-25% – 1-2 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – sub-rounded – equant –
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: rubbly
Additional comments:

BOX 159 CONTINUED ON NEXT PAGE



Box #: 159

Cores in box
214
215

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/93

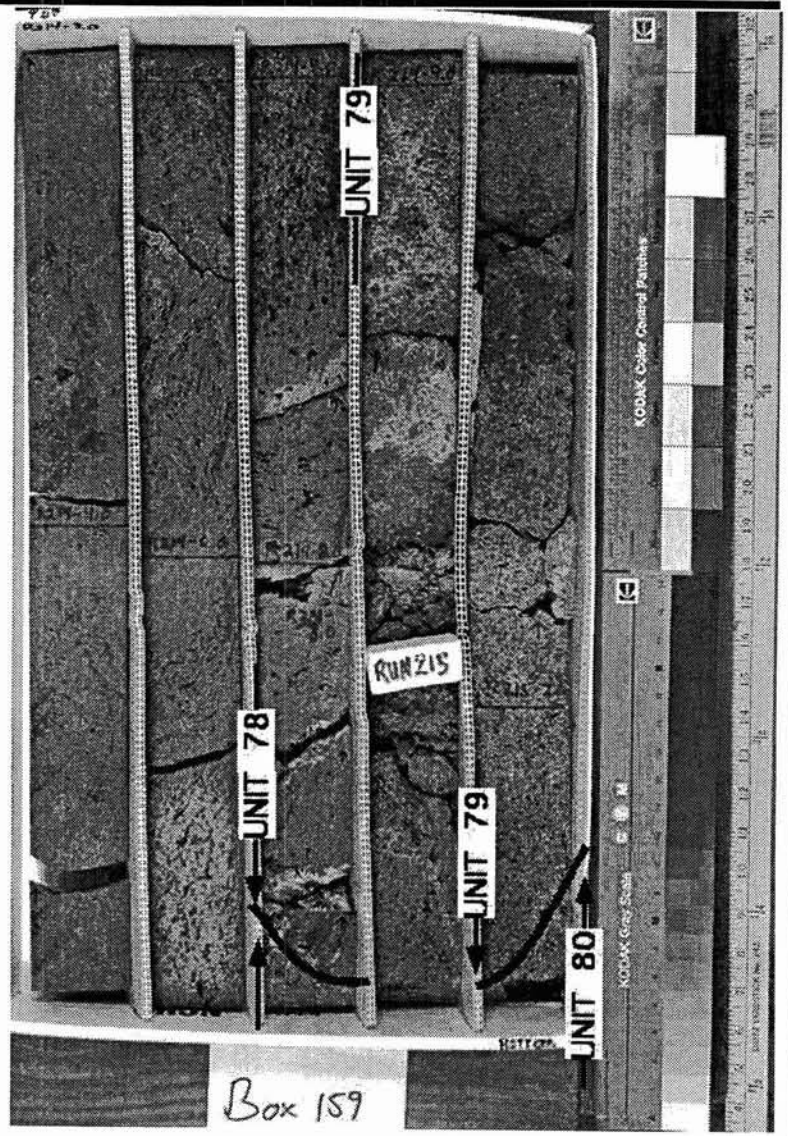
Driller's depth:top [feet]: 1407.1
Driller's depth:bottom [feet]: 1417.4
Core type: HQ

Units in box: 3

BOX UNIT 3: highly olivine phyric basalt

Contacts: Top (ft): (R 215-2.5-1418.4')(flow contact)
Bottom (ft): (R--')(cont. with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~20% – 2-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 4/6 mod. red – **Structures:** – **Sorting:** –
Vesicles: 0% – — – – –
Alteration: highly (40-80% altered) – clay
oxidation
Veins: none
Fractures: none
Additional comments:
only upper 0.2 ft of this unit present in this box; no vesicles

UNIT #: 80



Box #:	Cores in box
160	215 216

Loggers:	MBB
Date logged:	11/18/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1417.4
Driller's depth:bottom [feet]:	1427.9
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:80**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
from 215-2.6 to R215-3.8 angular moderately oxidized basalt clasts set in friable matrix of oxidized basalt and olivines; some clays (?) in matrix (see area labeled "A" on photo).

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-30% – 2-4 mm – equant –
20% at R215-7.5; 30% at R216-2.0; rare spinel (?) inclusions in the olivine phenocrysts. Locally some olivines have blue/black iridescent (MnO?) coatings.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray (fresh piece) – **Structures:** – **Sorting:** –

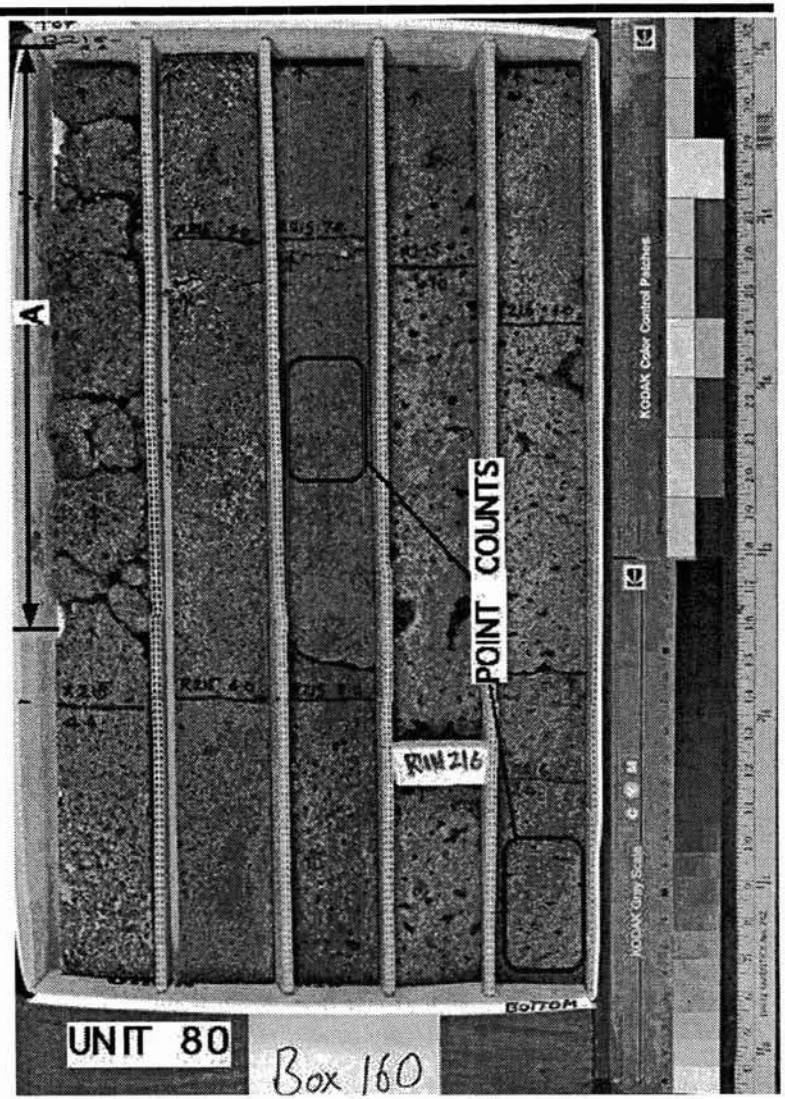
Vesicles: <1 to 10% – 1-5 mm – rounded to subangular – equant to elongate–
see alteration comments
Vesicles are small and equant from R215-2.6 to R215-8.0. Vesicle volume% and size changes below this depth. Reddish tint to some vesicle surfaces throughout the section.

Alteration: slightly to highly (2-80% altered) –
Groundmass is oxidized down to R215-3.8; yellow material (clay ?) in vesicles and on fractured surfaces between R215-3.8 and R215-5.5.

Veins: none

Fractures: below R215-3.8

Additional comments:
NaCl ppt



Box #: 161

Cores in box
216
217

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/93

Driller's depth:top [feet]: 1427.9
Driller's depth:bottom [feet]: 1436.9
Core type: HQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

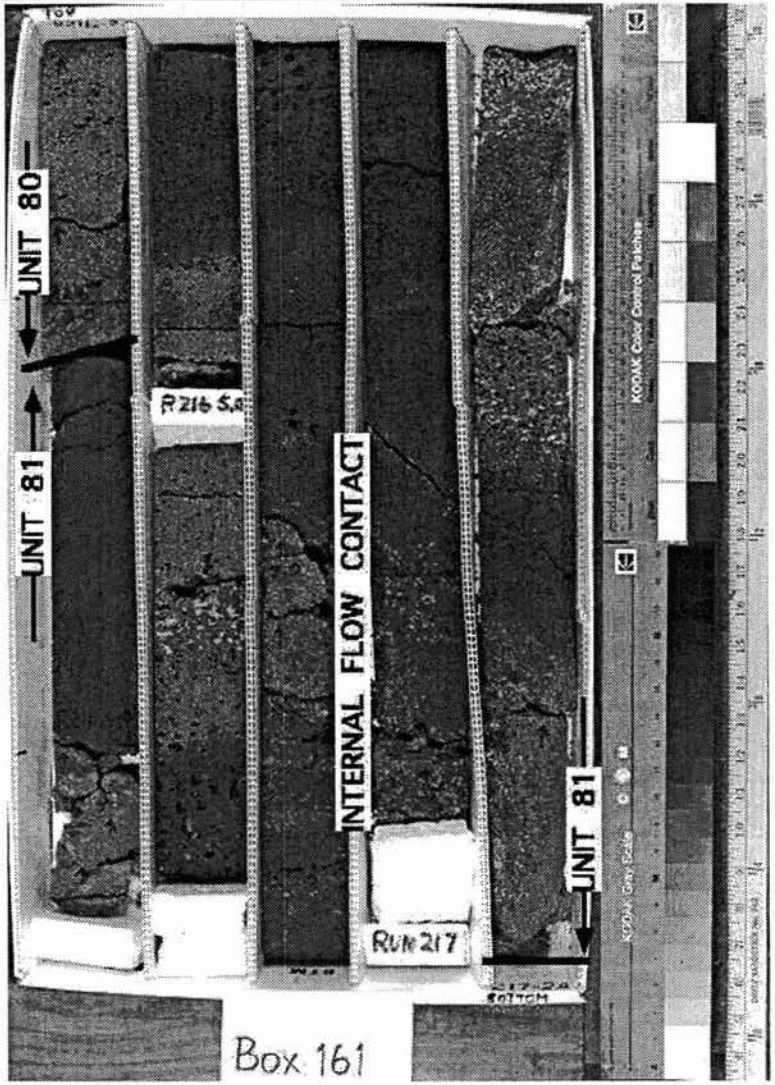
UNIT #: 80

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R216-3.1-1429.0')(flow contact)
red baked contact
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-26% – 1-3 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-4 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: 1/0.5 ft
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 81

Contacts: Top (ft): (R 216-3.1-1429.0')(flow contact)
Bottom (ft): (R217-2.0-1437.5')(flow contact)
internal flow contact at R216-9.3
Unit type: pahoehoe
highly vesicular top
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-3 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-2 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) –
clay in some vugs
Veins: none
Fractures: weakly fractured: 17/9 ft
Additional comments:



Box #:	Cores in box
162	217 218

Loggers: MBB
Date logged: 11/18/93
Checked by:
Check date:

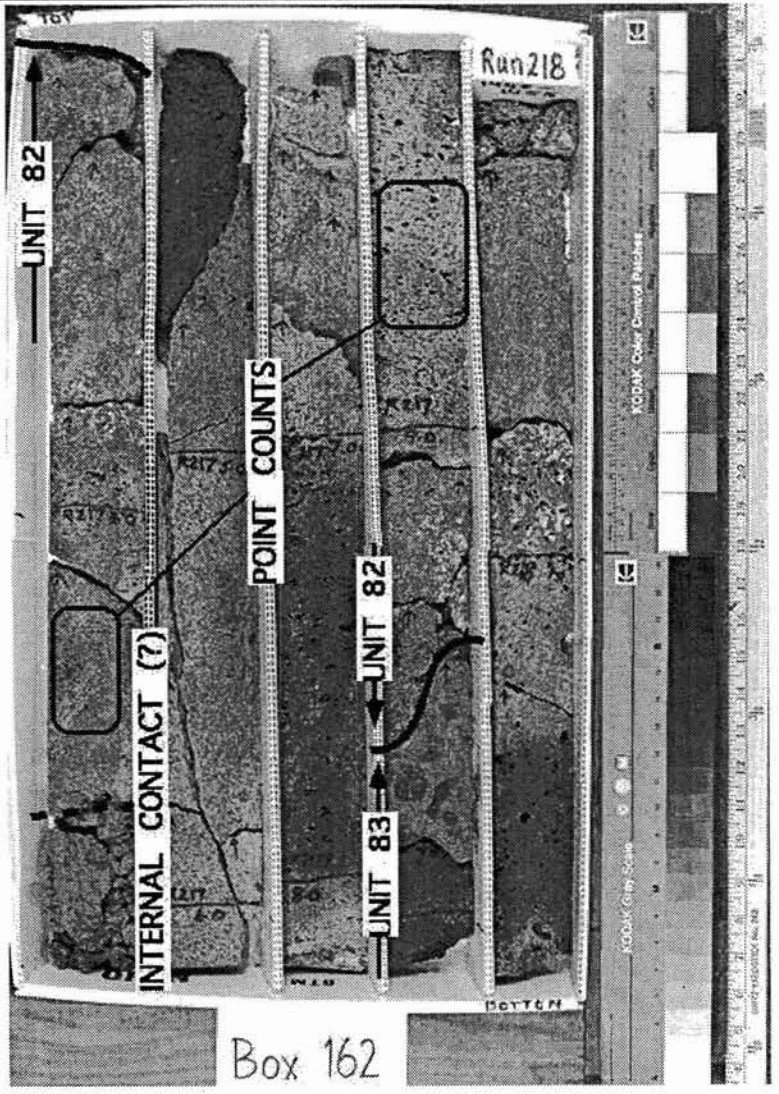
Driller's depth:top [feet]: 1436.9
Driller's depth:bottom [feet]: 1446.9
Core type: HQ
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 82

Contacts: Top (ft): (R 217-2.0-1437.5')(flow contact (?))
Bottom (ft): (R217-9.5-1445.0')(flow contact)
Upper flow contact defined by thin (<1 cm thick) oxidized zone, followed by a 22 cm thick more friable zone that contains angular basalt clasts and which grades into massive material; lower contact defined by a baked ash(?) layer.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-4 mm – equant –
14% at R217-3.4; 22% at R217-8.6; no obvious spinel inclusions in the olivine phenocrysts; in the interior portion of the unit, olivines display minor oxidation and iddingsite alteration, more altered near contacts
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-15% – 1-10 mm – subrounded to subangular – equant to horizontally elongate –
See photo for fluctuations in vesicle size and volume% throughout unit.
Alteration: slightly to moderately (2-40% altered) –
Extent of oxidation and proportion of ivory/yellow clay (?) decreases down section from the contact; minor amounts of clay are present at the base of the unit.
Veins: none
Fractures: weakly fractured: 14/7 ft, this measurement does not include the rubbly zone marked on the photo.
Additional comments:
NaCl ppt; filamentous clay(?) material on some fracture surfaces; rare cm-sized dunite xenoliths; possible internal flow contact at R217-3.7

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 83

Contacts: Top (ft): (R 217-9.5-1445.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for a description of the flow contact
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 11% – 2-4 mm – equant –
11% at R218-1.6; olivines are fresh except near contact where they are substantially oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 medium light gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 2-5 mm – rounded to subrounded – equant –
<1 mm sized vesicles occur near contact; light brown material (clays?) coating basalt surfaces inside vesicles and vugs (see photo)
Alteration: slightly to highly (2-80% altered) –
highly oxidized 10 cm thick zone at top of flow
Veins: none
Fractures: weakly fractured: 6/2.4 ft
Additional comments:
NaCl ppt



Box #: 163

Cores in box
218
219

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/94

Driller's depth:top [feet]: 1446.9
Driller's depth:bottom [feet]: 1456.3
Core type: HQ

Units in box: 4

BOX UNIT 1: moderately olivine phyric basalt

UNIT #: 83

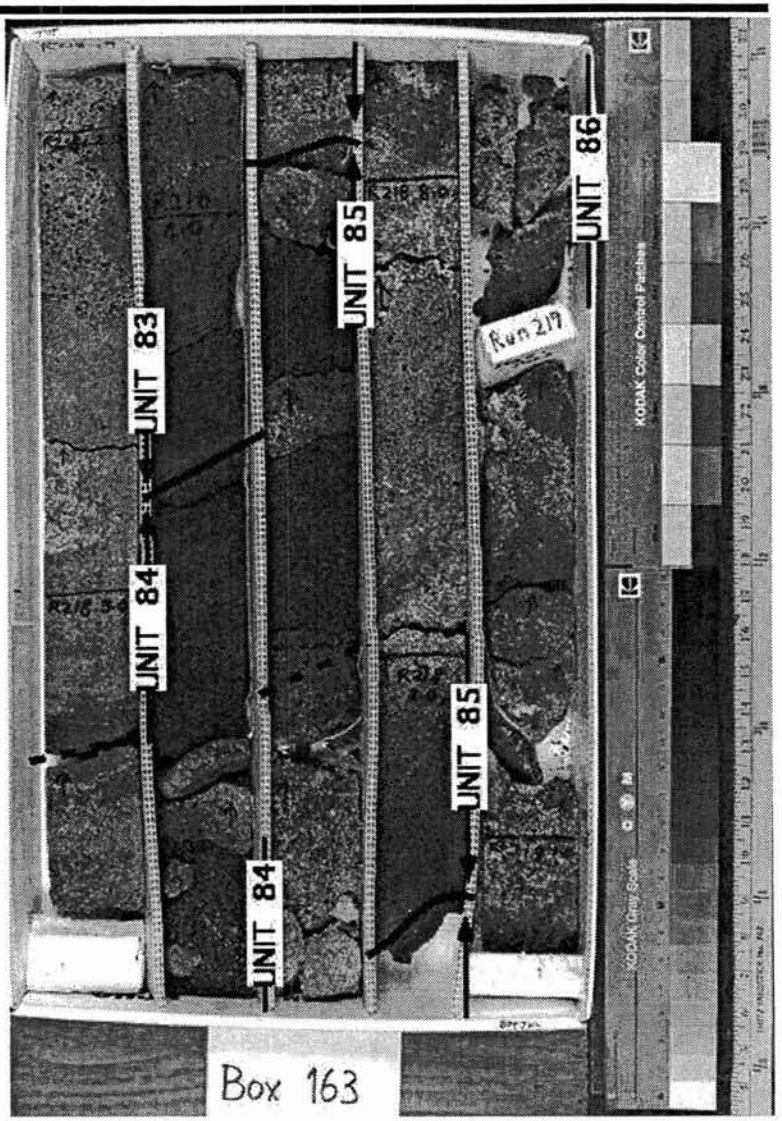
Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R218-4.5-1450.1')(flow contact)
baked vesicular just below contact; internal flow contact at R218-3.3
Unit type: pahoehoe
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-8% – 1-3 mm – equant –
200 pts counted at R218-2.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – variable – sub-rounded – equant –
<1 to 5 mm
Alteration: slightly to moderately (2-40% altered) –
Veins: none
Fractures: 1/1.5 ft
Additional comments:

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 84

Contacts: Top (ft): (R 218-4.5-1450.1')(flow contact)
Bottom (ft): (R218-6.0-1451.6')(flow contact)
baked top; ropy bottom (may be an internal contact)
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-3 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-3 mm – sub-rounded – equant –
Alteration: slightly to moderately (2-40% altered) – clay
Veins: none
Fractures: weakly: 3/1 ft
Additional comments:

BOX 163 CONTINUED ON NEXT PAGE



Box #: 163

Cores in box: 218, 219

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/94

Driller's depth:top [feet]: 1446.9
Driller's depth:bottom [feet]: 1456.3
Core type: HQ

Units in box: 4

BOX UNIT 3: highly olivine phyric basalt

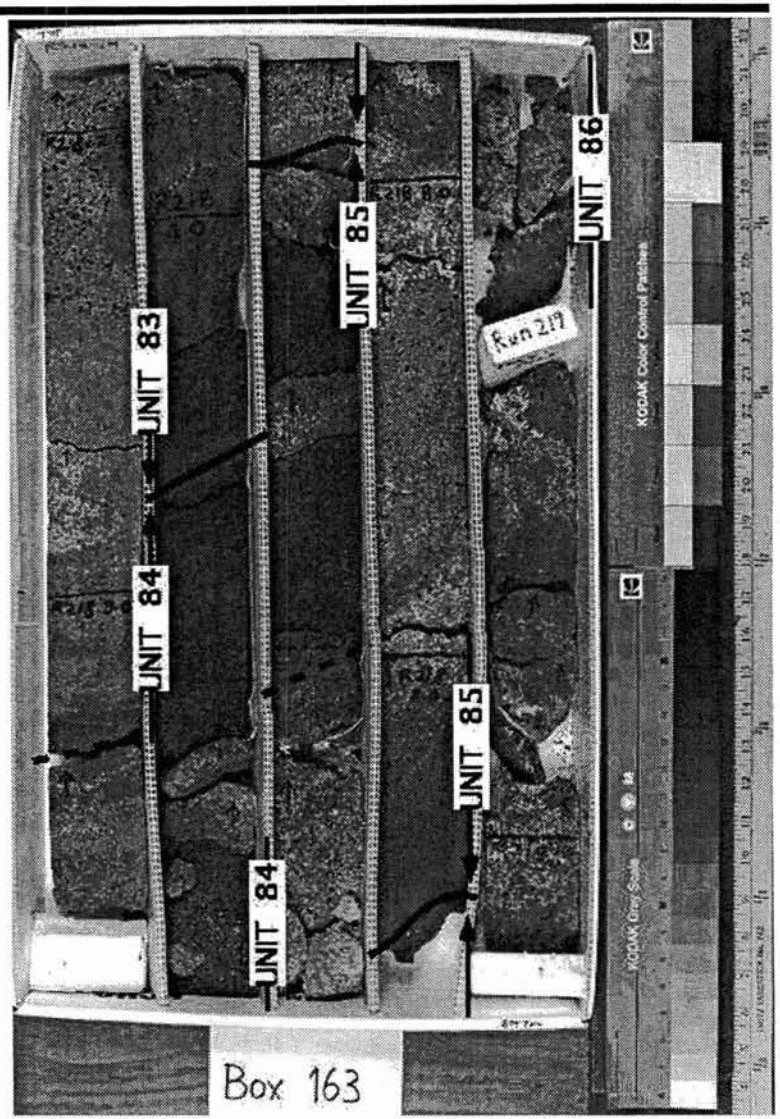
UNIT #: 85

Contacts: Top (ft): (R 218-6.0-1451.6')(flow contact)
Bottom (ft): (R218-9.5-1455.1')(flow contact)
possible internal contact at R218-6.9
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-3 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray– **Structures:** – **Sorting:** –
Vesicles: >30% – 1-3 mm – sub-rounded – equant–
Alteration: slightly to moderately (2-40% altered) – clay
clay-like material in vesicular areas
Veins: none
Fractures: moderately fractured: 8/2 ft
Additional comments:

BOX UNIT 4: highly olivine phyric basalt

UNIT #: 86

Contacts: Top (ft): (R 218-9.5-1455.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
ropy surface
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: variable– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant–
color: N4 med. dk. gray to 10 yr 5/4 mod.yellowish brown
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: moderately fractured: 4/1 ft; clay along fractures
Additional comments:



Box #: 164

Cores in box
219
220

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/93

Driller's depth:top [feet]: 1456.3
Driller's depth:bottom [feet]: 1465.5
Core type: HQ

Units in box: 2

BOX UNIT 1: moderately olivine phyric basalt

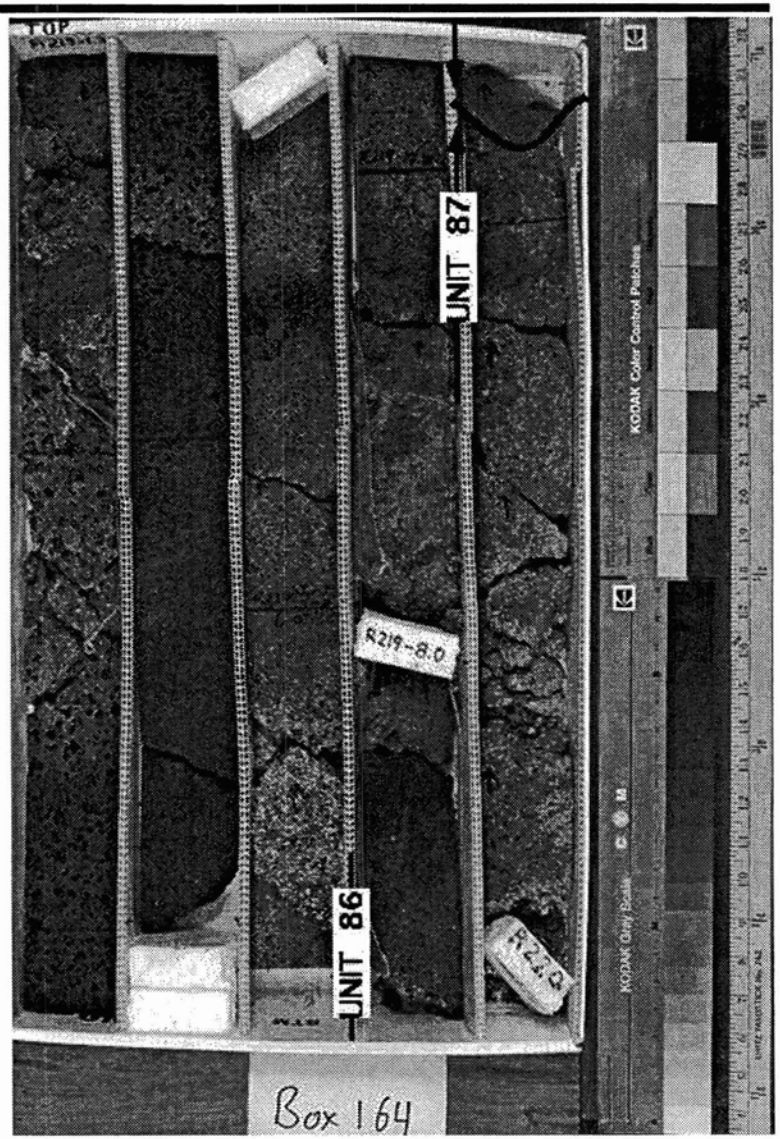
UNIT #: 86

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R219-8.8-1464.5')(flow contact)
baked, vesicular zone defines base
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-9% – – –
200 pts counted at R219-4.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 20 to >30% – <1 to 2 mm – sub-rounded – equant to horizontally elongated –
Alteration: slightly (2-10% altered) –
mild oxidation
Veins: none
Fractures: weak: 10/6 ft
Additional comments:

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 87

Contacts: Top (ft): (R 219-8.8-1464.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red vesicular top
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-30% – 2-4 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-2 mm – – –
Alteration: moderately (10-40% altered) – clay
oxidation
Veins: none
Fractures: rubbly
Additional comments:



Box #:	Cores in box
165	220

Loggers:	MBB
Date logged:	11/18/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1465.5
Driller's depth:bottom [feet]:	1475.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 87

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R220-5.1-1470.7')(flow contact)
flow contact defined by a sharp increase in degree of oxidation, by baked ash/soil horizons in lower flow, and by surface flow textures

Unit type: massive

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 2-4 mm – equant –
10% at R220-1.5; olivines partially to completely oxidized, correlates with extent of groundmass oxidation
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray (fresh piece) – **Structures:** – **Sorting:** –

Vesicles: 10-20% – 1-5 mm – rounded to subrounded – equant to sub-horizontally elongate –
oscillating regions of large and small vesicles (see photo)

Alteration: slightly to moderately (2-40% altered) –
Alteration consists of groundmass oxidation (patchy reddish-brown tint to groundmass).

Veins: none

Fractures: weakly fractured: 10/4.5 ft; soft white/yellow material (clay?) on some fracture surfaces

Additional comments:
see photo: "A" = slickensides on fracture surfaces
rare small (<5 mm) microgabbroic clasts present in unit

BOX UNIT 2: aphyric basalt — UNIT #: 88

Contacts: Top (ft): (R 220-5.1-1470.7')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for a description of flow contact.

Unit type: aa
From R220-5.1 to R220-8.0, the core consists of angular basaltic clasts set in a friable variably-sized matrix. Oxidized and baked between R220-5.1 and R220-6.5; yellow material (clay?) on the interior surfaces of the larger vugs in the friable zone.

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant –
0.6% at R220-9.0; rare spinel inclusions in olivine phenocrysts. Olivines are fresh in the massive zone and substantially oxidized in the clast-rich zone.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

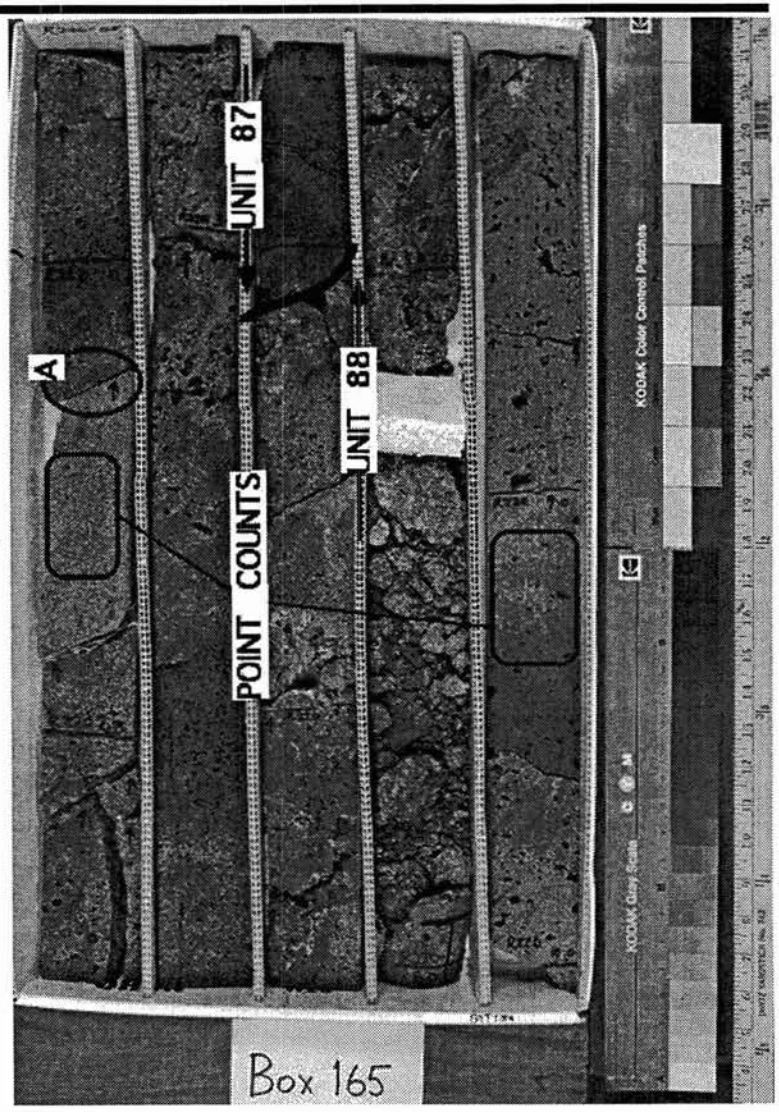
Vesicles: ~10% – 1-5 mm – rounded to subrounded – equant –
In the massive zone, some vesicles range up to 20 mm in longest dimension.

Alteration: fresh to highly (<2-80% altered) –
See "unit type" for comments.

Veins: none

Fractures: weakly fractured: 5/4 ft; doesn't include rubbly zone between R220-7.0 and R220-8.0

Additional comments:
NaCl ppt



Box #: 166

Cores in box
220
221

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/93

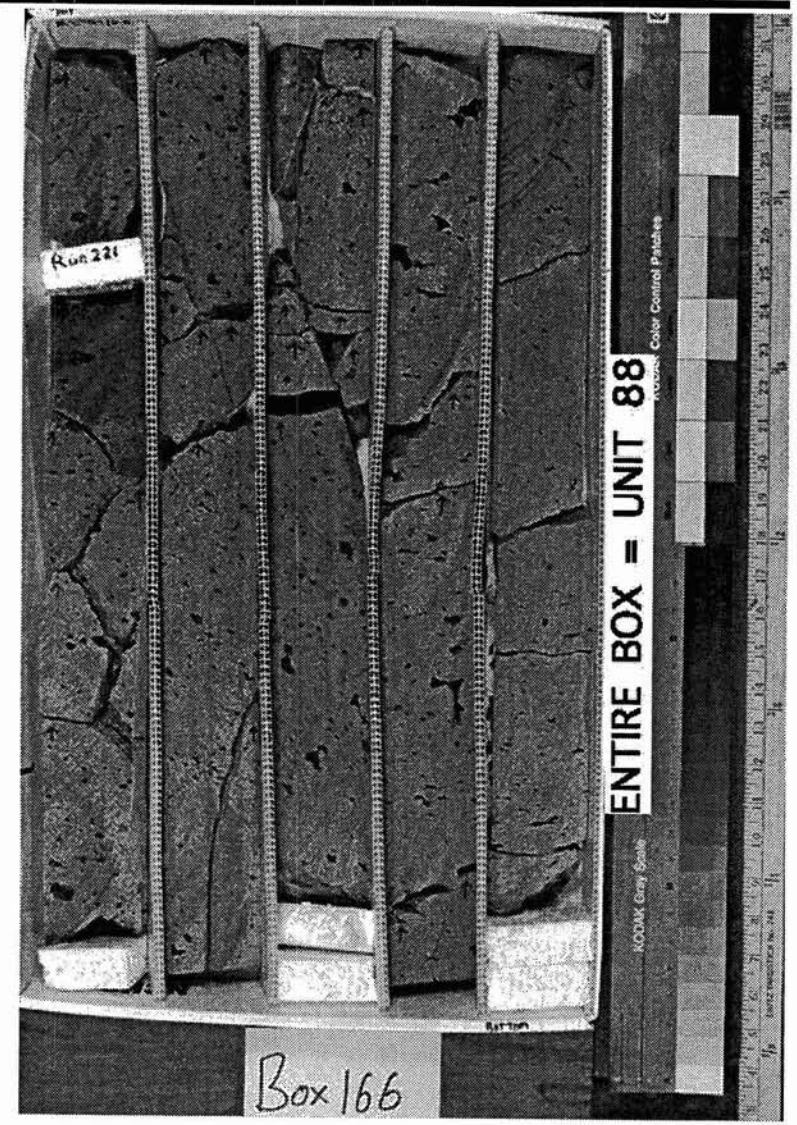
Driller's depth:top [feet]: 1475.0
Driller's depth:bottom [feet]: 1483.7
Core type: HQ

Units in box: 1

BOX UNIT 1: sparsely olivine phyric basalt

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – ~1% – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-10 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly to moderately
Additional comments:

UNIT #:88



Box #: 167

Cores in box
221
222

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/93

Driller's depth:top [feet]: 1483.7
Driller's depth:bottom [feet]: 1492.2
Core type: HQ
Units in box: 2

BOX UNIT 1: sparsely olivine phyric basalt

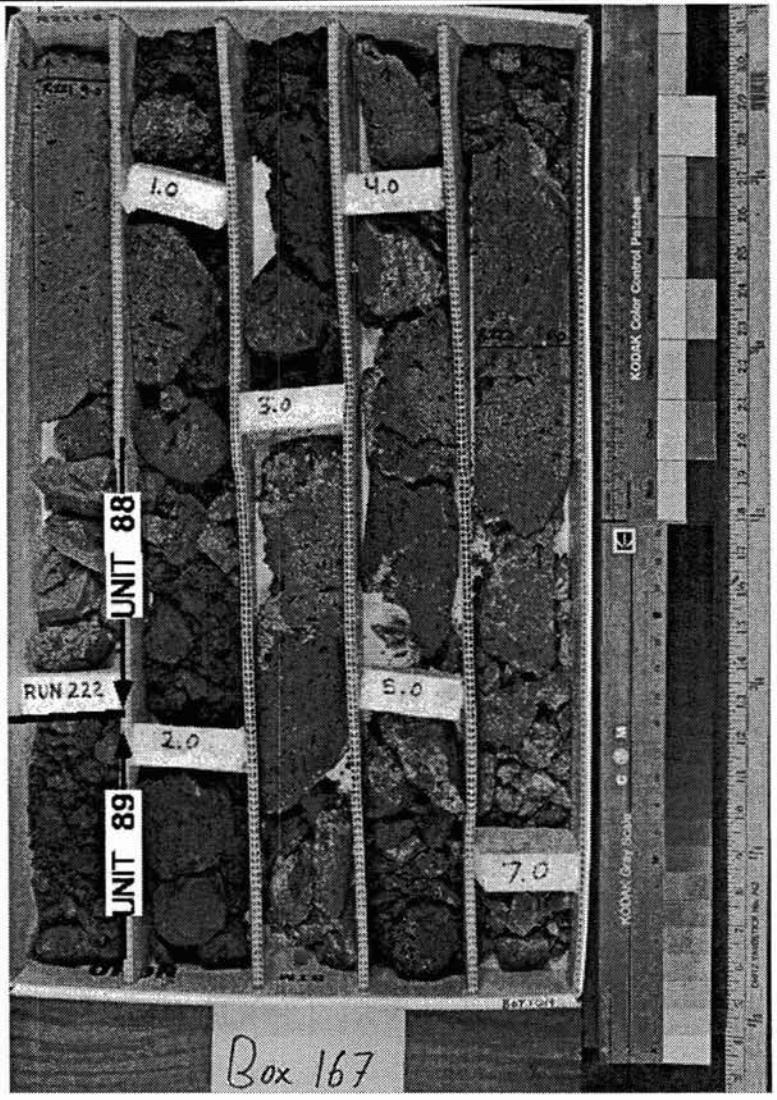
UNIT #: 88

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R222-0.0-**1486.1**')(flow contact)
red rubble at base
Unit type: massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – ~1% – 2 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-3 mm – sub-rounded – horizontally elongated–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: strongly at base
Additional comments:

BOX UNIT 2: moderately olivine phyric basalt

UNIT #: 89

Contacts: Top (ft): (R 222-0.0-**1486.1**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 1-5 mm – equant to blocky –
200 points counted at R227-6.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 2-4 mm – sub-angular – equant–
Alteration: fresh to slightly (<2-10% altered) – clay
Veins: none
Fractures: highly to moderately
Additional comments:



Box #: **168**

Cores in box
222
223

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/93

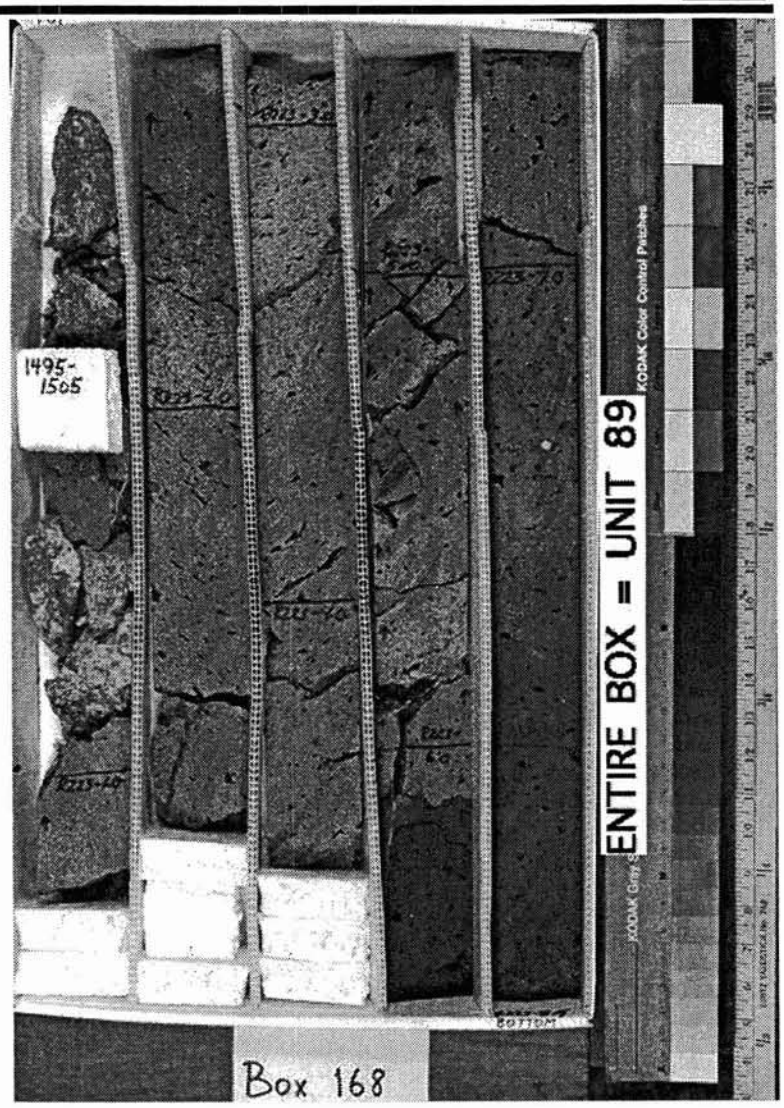
Driller's depth:top [feet]: 1492.2
Driller's depth:bottom [feet]: 1503.2
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:89

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-5% – 1-3 mm – equant –
200 points counted at R223-6.8
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 2-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
fresher towards base of box
Veins: none
Fractures: weakly to moderately
Additional comments:
mild NaCl ppt (it redissolved into rock?)



Box #:	Cores in box
169	223 224

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/93

Driller's depth:top [feet]: 1503.2
Driller's depth:bottom [feet]: 1512.5
Core type: HQ

Units in box: 2

BOX UNIT 1: moderately olivine phyric basalt

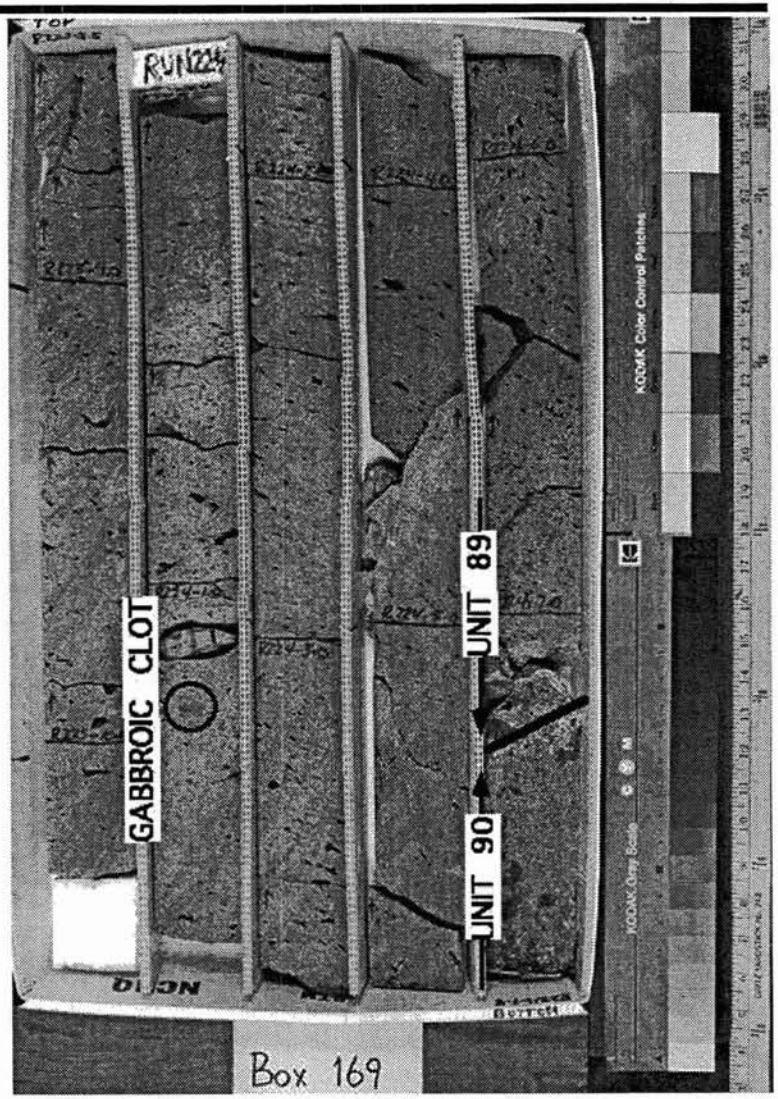
UNIT #: 89

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R224-7.1-1512.4')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 1-4 mm – equant –
100 points counted
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – bimodal – sub-rounded – horizontally elongated –
1-2 mm and 6-8 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 11/6 ft
Additional comments:
open-textured gabbro clot at R224-1.2; mild NaCl ppt

BOX UNIT 2: moderately olivine phyric basalt

UNIT #: 90

Contacts: Top (ft): (R 224-7.1-1512.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubbly top
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2% – 1-3 mm – equant –
– – – –
– – – –
Groundmass/Matrix: rubble –
Color: med. red – **Structures:** – **Sorting:** –
Vesicles: none – – – –
except in clasts (10-20%; 1 mm subangular, equant)
Alteration: moderately (10-40% altered) – clay
Veins: none
Fractures: rubble
Additional comments:



Box #: 170

Cores in box
224
225

Loggers:	MBB
Date logged:	11/18/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1512.5
Driller's depth:bottom [feet]:	1522.2
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:90

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
From R224-7.8 to R224-10.0, oxidized subangular to angular basaltic clasts (5 mm to 100 mm in longest dimension) are set in a weathered friable matrix with variable clay content.

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-10% – 2-4 mm – equant to tabular –
7% at R225-2.8; 10% at R225-7.2; no obvious spinel inclusions; partially to completely oxidized within oxidized rubbly zone
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

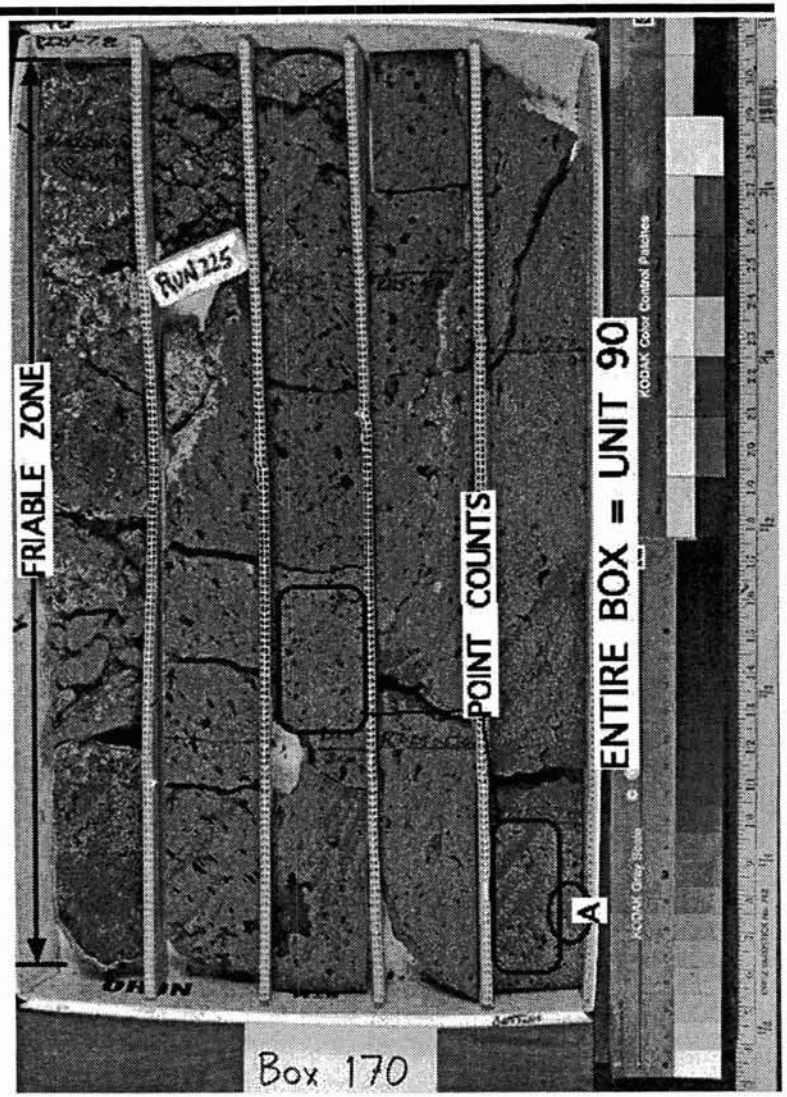
Vesicles: 5-10% – <1-5 mm – rounded to subangular – equant to elongate –
an abundance of sheared vesicles below R225-6.0

Alteration: fresh to highly (<2-80% altered) –
Some fractures have white/yellow clay(?) coatings on surfaces.

Veins: none

Fractures: weakly fractured: 11/7.3 ft; measured below oxidized rubbly zone

Additional comments:
see photo: "A" = dunite inclusion



Box #:	Cores in box
171	225 226

Loggers:	MG
Date logged:	11/18/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1522.2
Driller's depth:bottom [feet]:	1531.6
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt

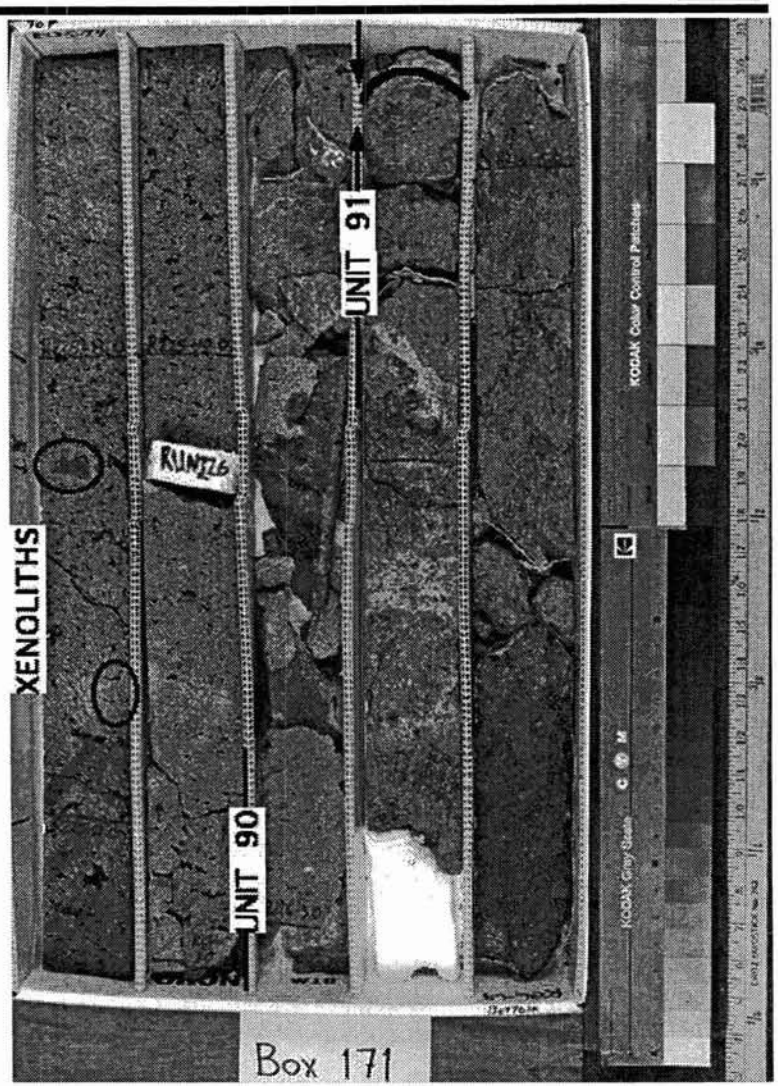
UNIT #: 90

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R226-3.1-1528.9')(flow contact)
baked rubble base
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-8% – 1-4 mm – equant –
100 pts counted at R225-8.8
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – variable – sub-angular – horizontally elongated –
flow banded streaks of vesicles
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly to moderately: 6/4 ft to many
Additional comments:
wehrlite xenolith at R225-8.3; mild NaCl ppt (NaCl disappeared!?)

BOX UNIT 2: moderately olivine phyric basalt

UNIT #: 91

Contacts: Top (ft): (R 226-3.1-1528.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubbly for 4 ft
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 7-9% – 2-4 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% – ~1 mm – sub-angular – equant –
Alteration: moderately (10-40% altered) – clay
Veins: none
Fractures: rubbly to highly
Additional comments:
NaCl ppt



Box #:	Cores in box
172	226 227

Loggers:	MBB
Date logged:	11/18/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1531.6
Driller's depth:bottom [feet]:	1540.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:91**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
From R226-6.9 to R227-3.5 there are moderately to slightly oxidized subangular clasts set in a friable matrix that grades into massive material by R227-3.5.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~18% – 3-5 mm – equant to tabular –
18% at R227-3.6; olivine phenocrysts contain spinel inclusions; in the clast-rich zone the extent of olivine oxidation is rather variable; in the massive portion of the unit, the olivines are relatively fresh
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray (fresh piece) – **Structures:** – **Sorting:** –

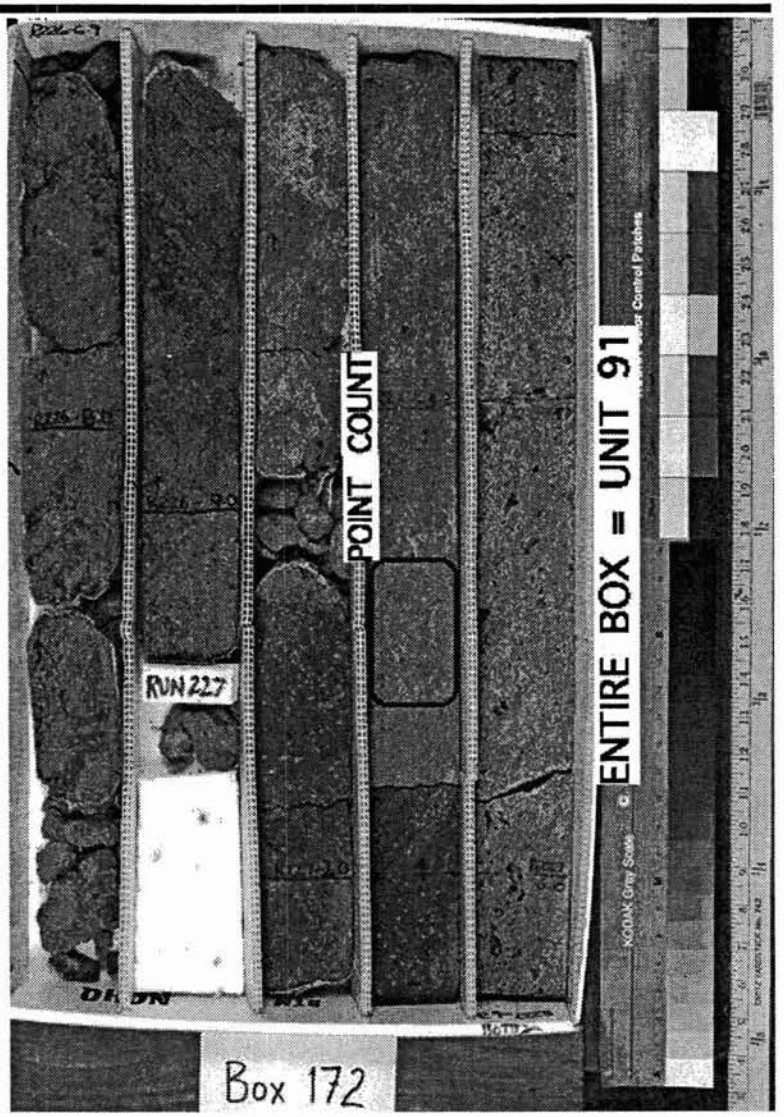
Vesicles: <1-5% – 1-5 mm – rounded to subangular – equant to elongate (no preferred orientation) –

Alteration: fresh to moderately (<2-40% altered) –
The extent of oxidation decreases gradually from the top to the bottom of the box.

Veins: none

Fractures: generally weakly fractured except for rubbly zones (see photo); white/yellow clays (?) coating some fracture surfaces

Additional comments:



Box #:	Cores in box
173	227 228 229

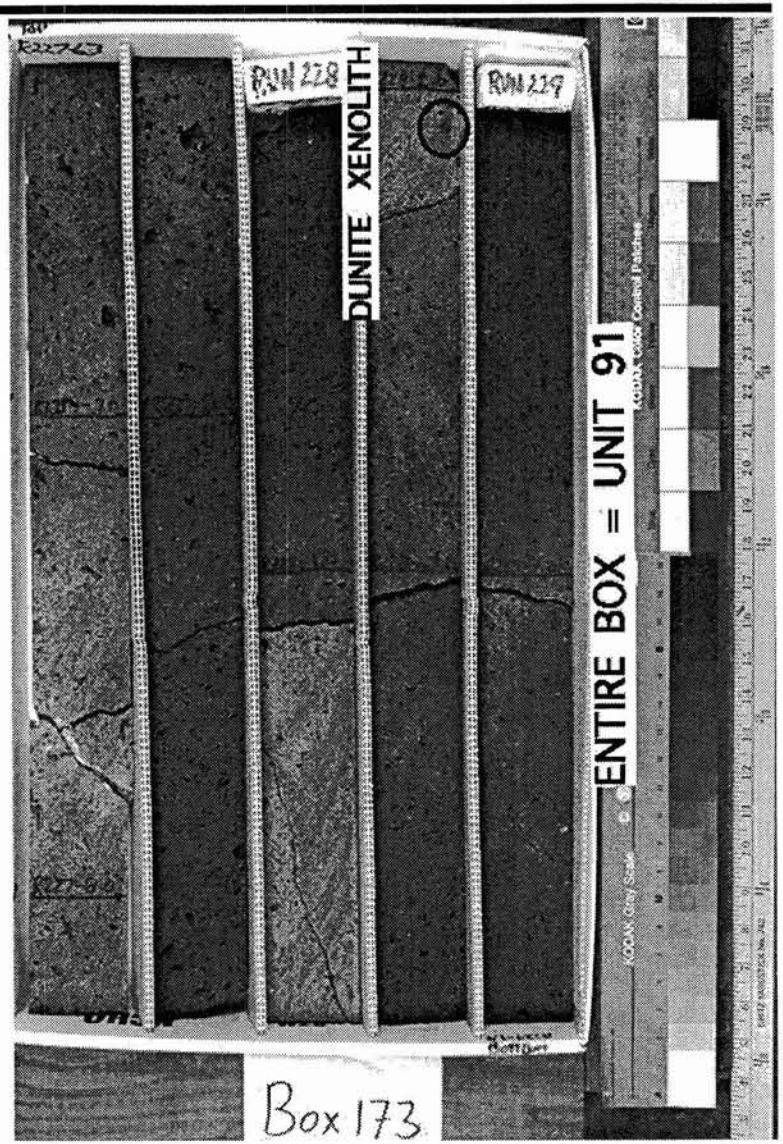
Loggers:	MG
Date logged:	11/18/93
Checked by:	MG
Check date:	11/30/93

Driller's depth:top [feet]:	1540.7
Driller's depth:bottom [feet]:	1551.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:91

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-7% – 1-3 mm – equant –
multi-grain aggregates common
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – equant to horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 9/10 ft
Additional comments:
dunite xenolith at R228-2.1; NaCl ppt



Box #: 174

Cores in box: 229, 230

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 11/30/93

Driller's depth:top [feet]: 1551.7
Driller's depth:bottom [feet]: 1561.2
Core type: HQ

Units in box: 2

BOX UNIT 1: moderately olivine phyric basalt

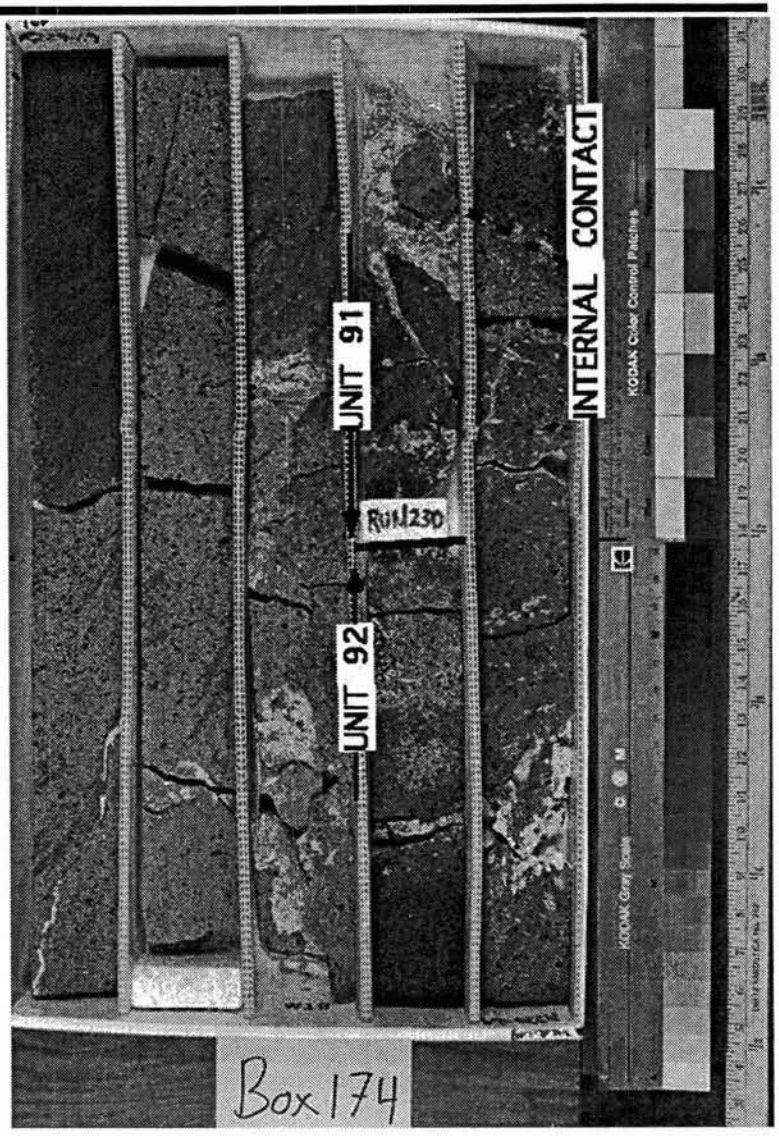
UNIT #: 91

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R230-0.0-1558.8')(flow contact)
red rubble base
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 1-3 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-3 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly to moderately: 1/2 ft to 8/1 ft; healed fracture with clay-like material; tubular material present on some fractures
Additional comments:
NaCl ppt (redissolved?)

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 92

Contacts: Top (ft): (R 230-0.0-1558.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red rubbly top; red internal zone at R230-1.4
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25-30% – 1-4 mm – equant –
100 pts counted at R230-2.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 4/2 gray red – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) –
oxidized
Veins: none
Fractures: weakly: 6/3 ft
Additional comments:



Box #: 175

Cores in box
230
231

Loggers: MG
Date logged: 11/18/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1561.2
Driller's depth:bottom [feet]: 1570.5
Core type: HQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

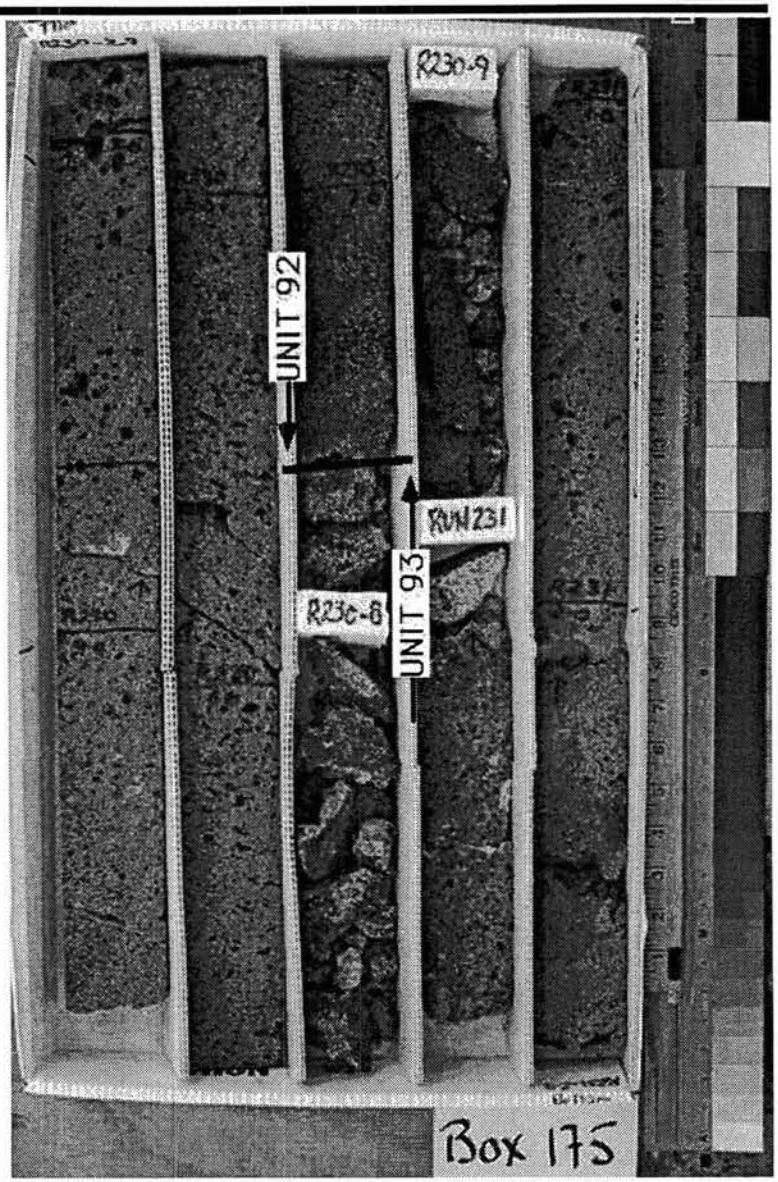
UNIT #: 92

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R230-7.8-1566.6')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25-30% – 1-4 mm – equant –
100 pts counted at R230-3.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 3-8 mm – spherical – equant –
Alteration: slightly (2-10% altered) –
oxidized
Veins: none
Fractures: weakly: 5/4 ft
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 93

Contacts: Top (ft): (R 230-7.8-1566.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
rubbly top noted by blackened olivines in upper part of flow; no soil or red zone present
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-25% – 1-4 mm – equant –
100 pts counted at R231-1.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – bimodal – spherical – horizontally elongated –
<1 mm and 4-6 mm
Alteration: slightly (2-10% altered) –
oxidized, dark olivine
Veins: none
Fractures: weakly: 4/3 ft
Additional comments:
rare dunitic xenoliths between R231-1.0 and 2.0; NaCl ppt



Box #: 176

Cores in box
231
232

Loggers: MG
Date logged: 11/19/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1570.5
Driller's depth:bottom [feet]: 1579.7
Core type: HQ

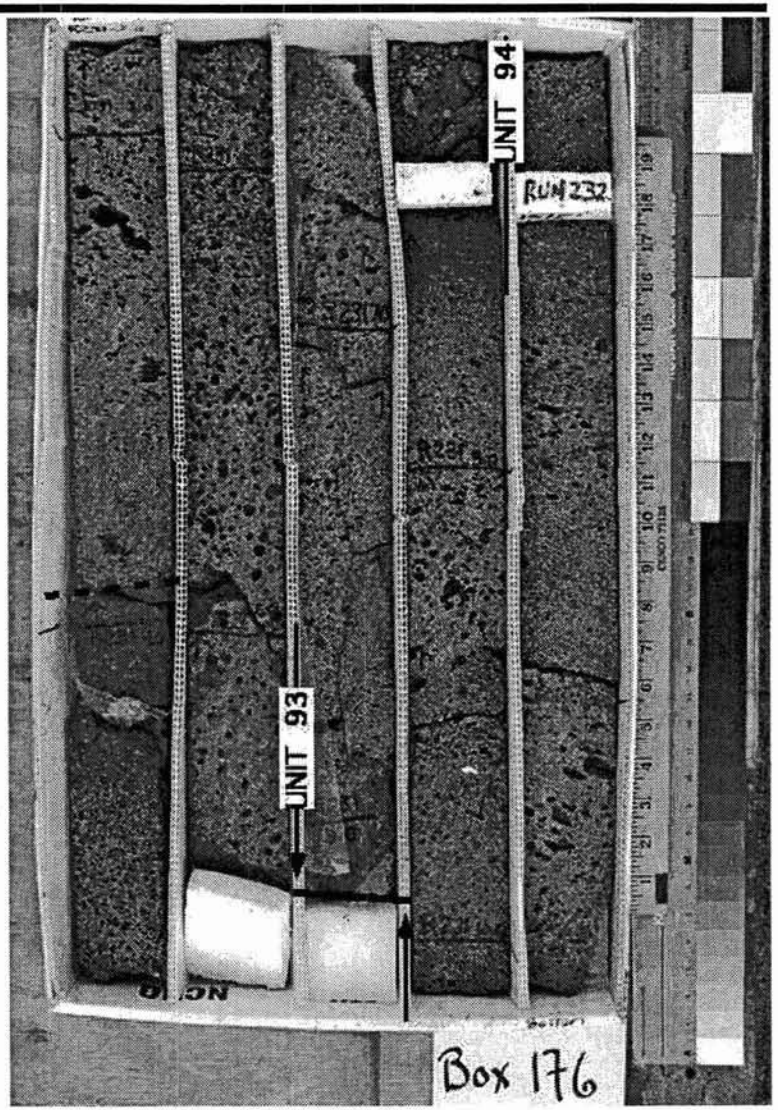
Units in box: 2

BOX UNIT 1: highly plagioclase-olivine phyric basalt — UNIT #: 93

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R231-6.5-1575.0')(flow contact)
rubbly reddish brown, more vesicular base, internal flow contact at R231-3.9 (highly vesicular, gritty zone)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15% – 1-3 mm – equant to blocky –
100 pts counted at R231-3.5; some very large grains (5-6 mm)
plagioclase – <<1% – ~1 mm – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – variable – spherical – equant–
grading downward from 5 mm to <1 mm at contact
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 9/6 ft
Additional comments:
NaCl around olivine

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 94

Contacts: Top (ft): (R 231-6.5-1575.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
rubbly, more vesicular top, reddish cast to rubble
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – bimodal – spherical – horizontally elongated–
~1 to 3-4 mm
Alteration: slightly (2-10% altered) - oxidized –
Veins: none
Fractures: weakly: 2/4 ft
Additional comments:
NaCl ppt



Box #:	Cores in box
177	232 233

Loggers:	MG
Date logged:	11/19/93
Checked by:	MG
Check date:	12/12/93

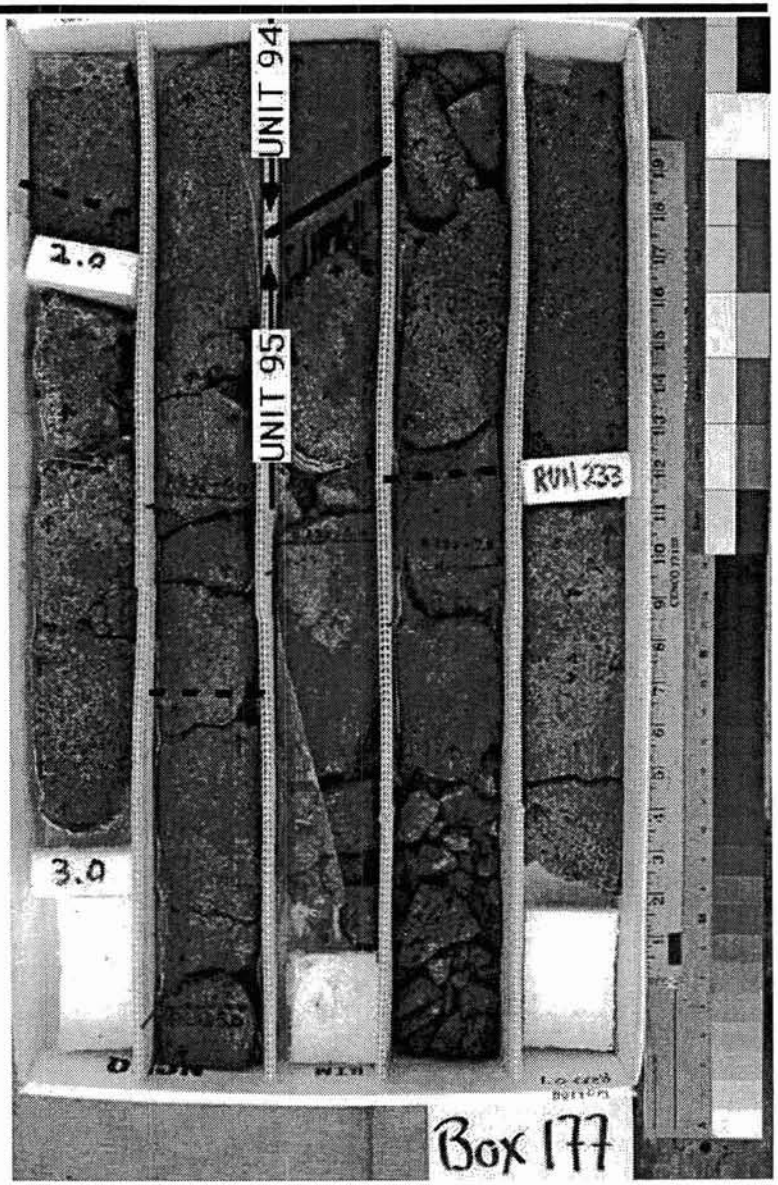
Driller's depth:top [feet]:	1579.7
Driller's depth:bottom [feet]:	1588.5
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 94

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R232-5.3-1584.1')(flow contact)
base marked by higher vesicularity, rubble and red baked zone
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-3 mm – equant to blocky – iddingsite and oxidation
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: variable – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-3 mm – sub-rounded – equant–
Alteration: slightly to moderately (2-40% altered) – clay + oxidation
Veins: none
Fractures: moderately
Additional comments:
color varies from 10R 4/6 (med. reddish brown) in rubble zones to 10R 2/2 (very dusky red)

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 95

Contacts: Top (ft): (R 232-5.3-1584.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15% – 1-4 mm – equant to blocky –
100 pts counted at R233-0.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 3/4 dusky red– **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1-2 mm – spherical – equant–
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: rubbly to weakly: 1/2 ft
Additional comments:



Box #: 178

Cores in box
233
234

Loggers: MG
Date logged: 11/19/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1588.5
Driller's depth:bottom [feet]: 1598.5
Core type: HQ

Units in box: 3

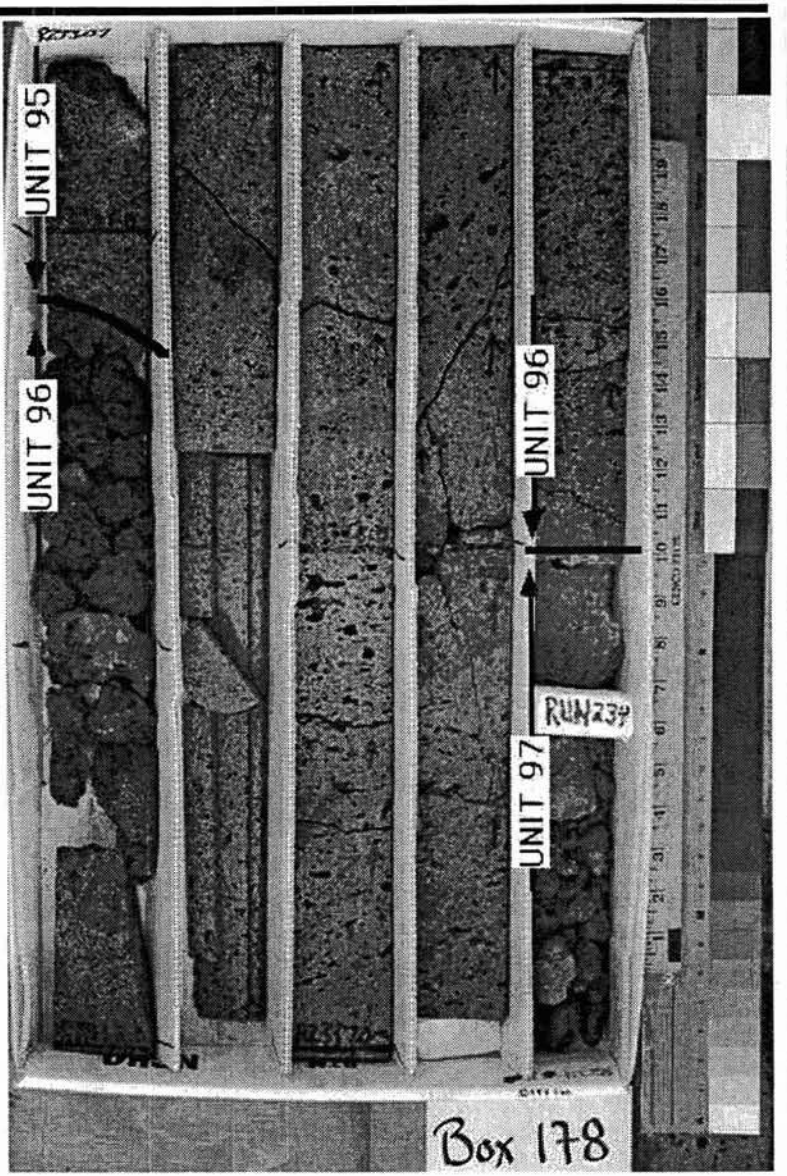
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 95

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R233-1.1-1589.9')(flow contact)
red, baked rubble/clinker base
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-4 mm – equant – iddingsite and oxidation
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dk. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – <1-2 mm – sub-rounded – equant–
Alteration: slightly (2-10% altered) – oxidation
Veins: none
Fractures: none
Additional comments:
NaCl ppt, plagioclase xenocrysts at R233-0.9

BOX UNIT 2: moderately to highly olivine phyric basalt — UNIT #: 96

Contacts: Top (ft): (R 233-1.1-1589.9')(flow contact)
Bottom (ft): (R233-10.0-1598.8')(flow contact)
clinkery rubble top; same at base
Unit type: aa
Phenocrysts/Clasts:
moderately to highly phyric (2->10%) –
olivine – 8-12% – 1-3 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-4 mm – sub-angular – horizontally elongated–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 12/7 ft
Additional comments:
NaCl around olivine

BOX 178 CONTINUED ON NEXT PAGE



Box #: 178

Cores in box
233
234

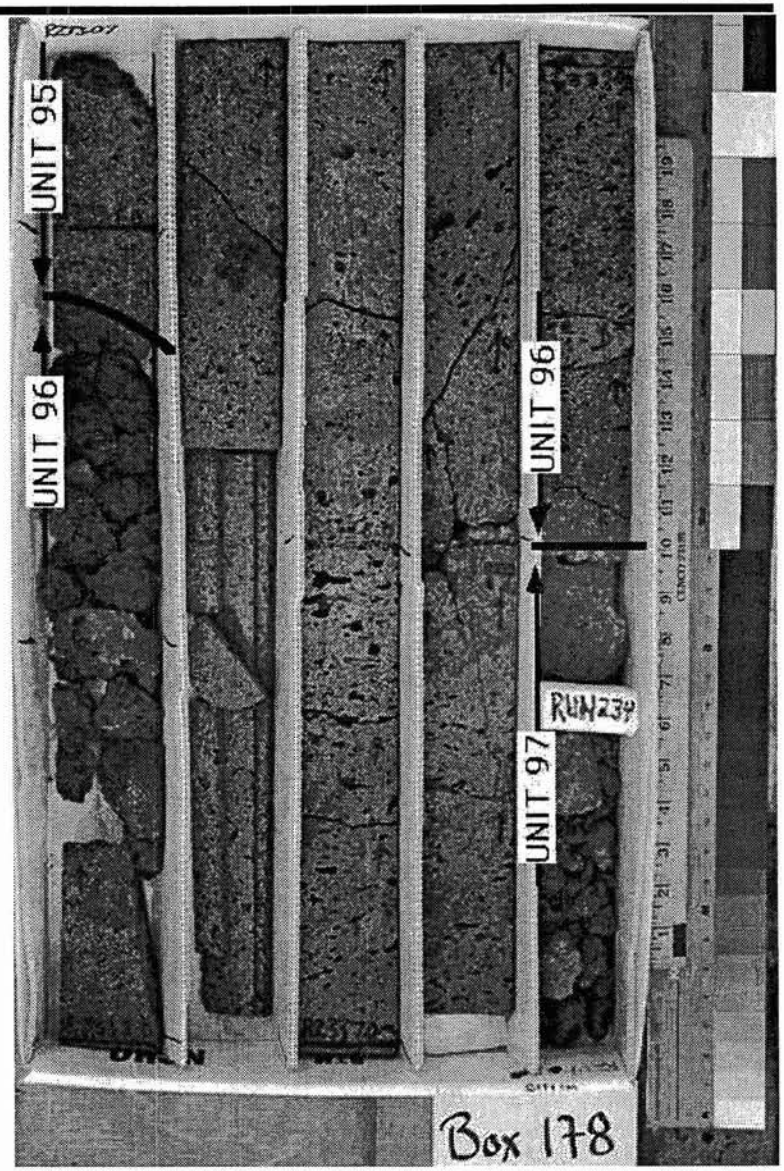
Loggers: MG
Date logged: 11/19/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1588.5
Driller's depth:bottom [feet]: 1598.5
Core type: HQ
Units in box: 3

BOX UNIT 3: moderately to highly olivine phyric basalt

UNIT #: 97

Contacts: Top (ft): (R 233-10.0-1598.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red baked rubbly top
Unit type: aa
Phenocrysts/Clasts:
moderately to highly phyric (2->10%) –
olivine – ~10% – 1-3 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 4/6 mod. red brown– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – spherical – equant–
Alteration: highly (40-80% altered) – clay
Veins: none
Fractures: none
Additional comments:
rubbly aa top



Box #: 179

Cores in box: 234

Loggers: MG
Date logged: 11/19/93
Checked by: MG
Check date: 12/12/93

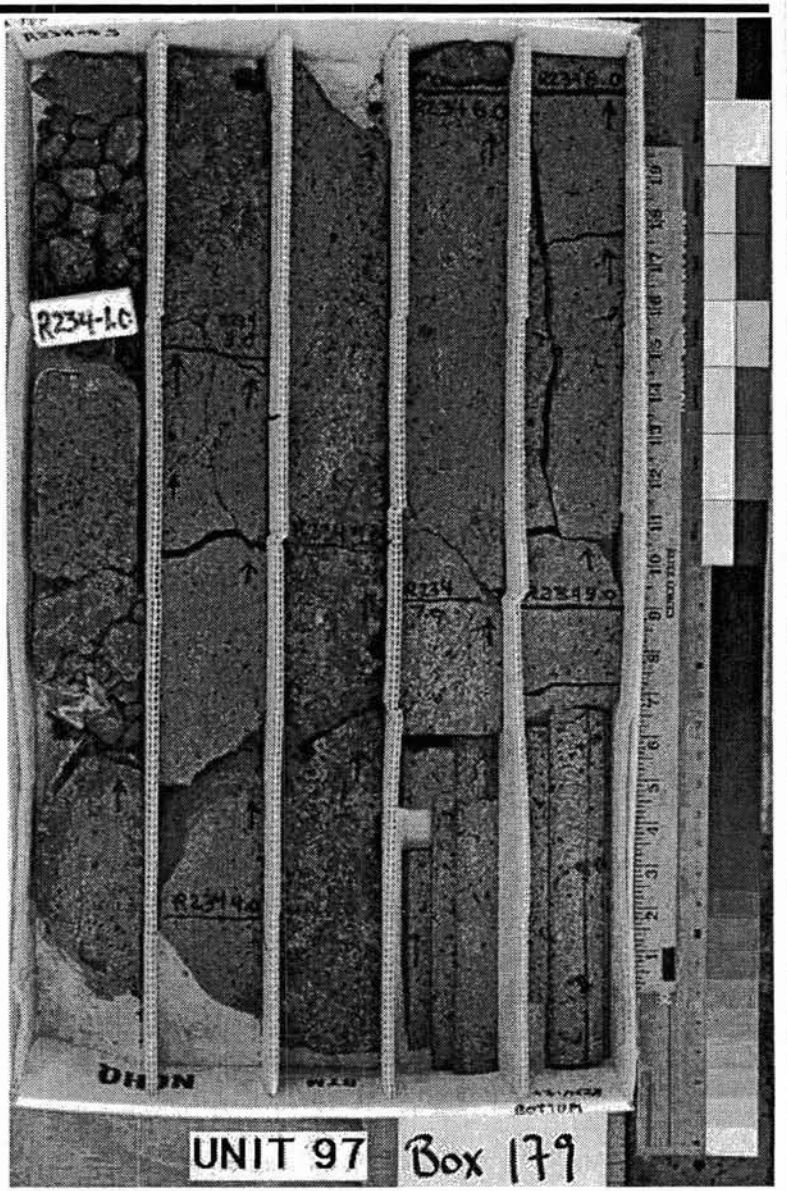
Driller's depth:top [feet]: 1598.5
Driller's depth:bottom [feet]: 1607.9
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:97

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 1-3 mm – equant to blocky –
100 pts counted at R234-4.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-3 mm – sub-rounded – inclined (~30°) –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 11/8 ft
Additional comments:
very rare gabbroic and spinel inclusions/xenocryst at R234-9.0



Box #: 180

Cores in box
234
235

Loggers: MG
Date logged: 11/19/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1607.9
Driller's depth:bottom [feet]: 1618.0
Core type: HQ

Units in box: 2

BOX UNIT 1: moderately olivine phyric basalt

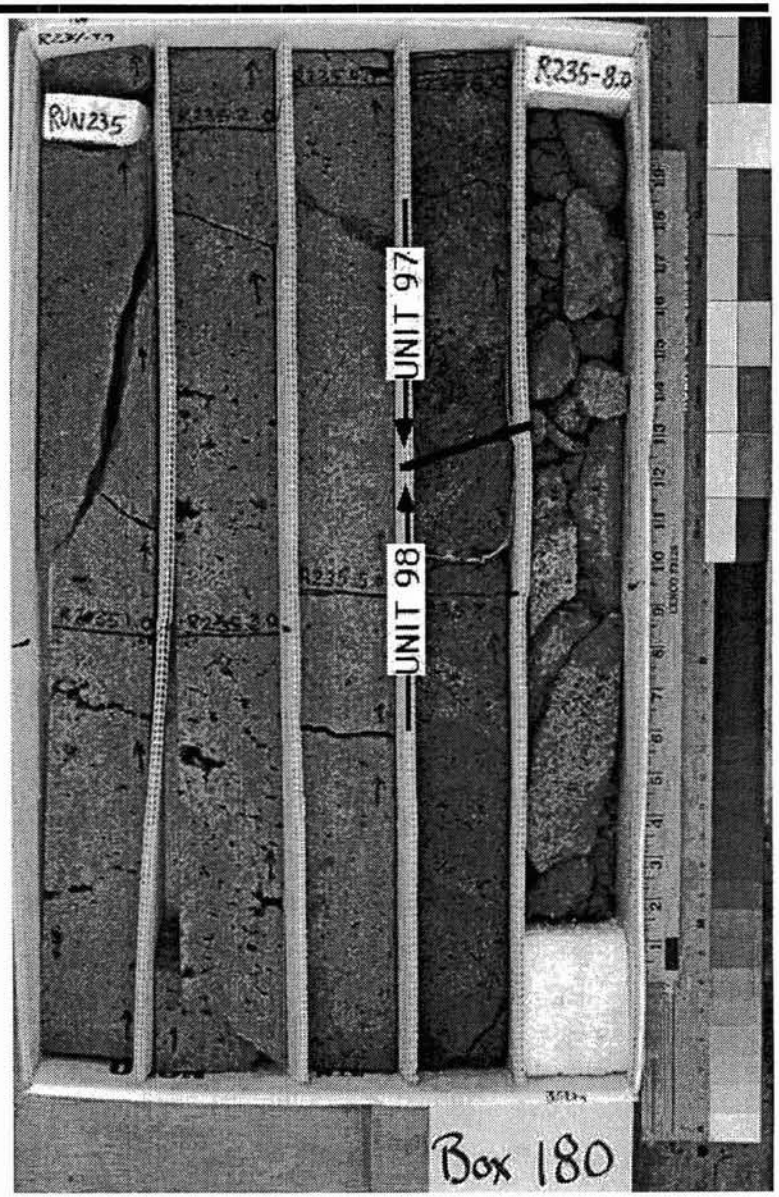
UNIT #: 97

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R235-6.7-1615.7')(flow contact)
red rubble at base
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 1-4 mm – equant to blocky –
100 pts counted at R235-1.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – bimodal – sub-rounded – horizontally elongated–
~1 and 4-10 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 4/6 ft
Additional comments:
NaCl ppt

BOX UNIT 2: moderately olivine phyric basalt

UNIT #: 98

Contacts: Top (ft): (R 235-6.7-1615.7')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red rubble top
Unit type: aa (?)
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 8-10% – 1-3 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 2/2 blackish red– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – equant to horizontally elongated–
Alteration: slightly (2-10% altered) – clay, oxidation
Veins: none
Fractures: rubbly
Additional comments:
NaCl ppt



Box #:	Cores in box
181	236 237 238

Loggers:	MBB
Date logged:	11/20/93
Checked by:	MG
Check date:	12/12/93

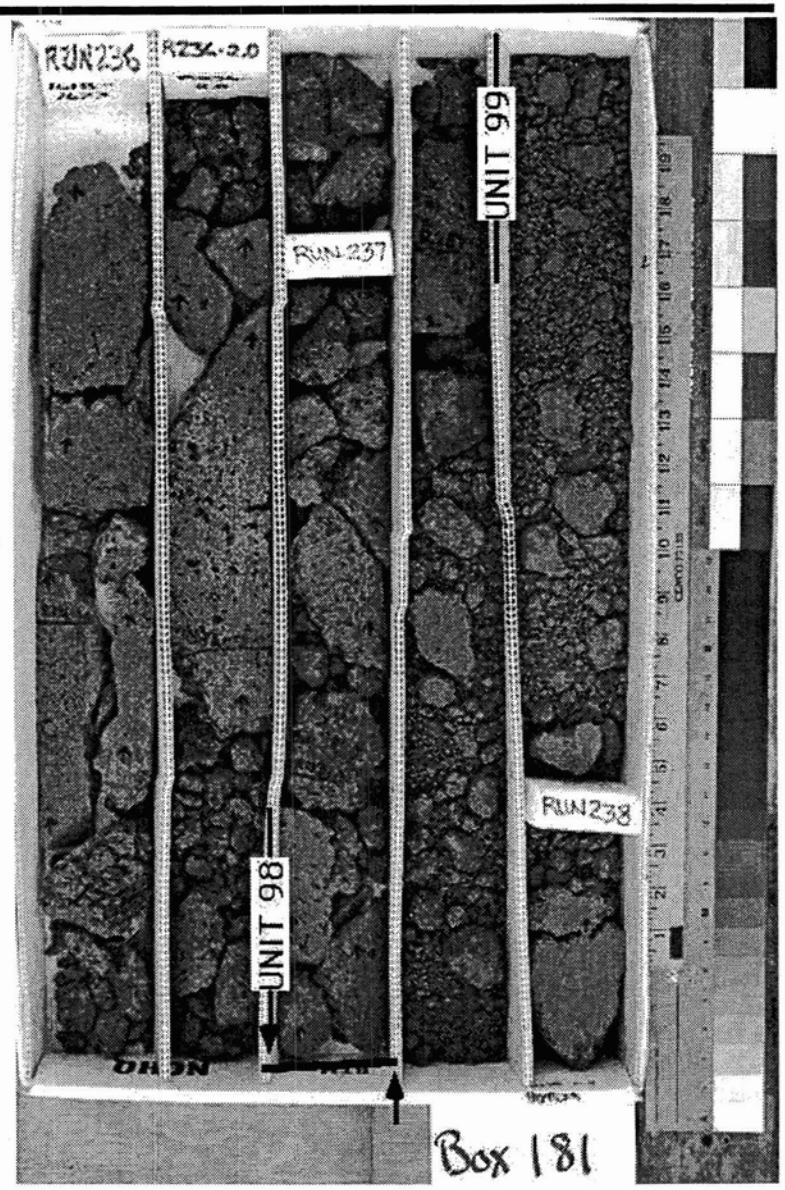
Driller's depth:top [feet]:	1618.0
Driller's depth:bottom [feet]:	1629.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 98

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R237-1.5-1624.5')(flow contact)
Flow contact defined by dramatic change in the extent of oxidation; top of bottom flow (R237-1.5 to bottom of box) consists of oxidized olivine phenocrysts and less oxidized basalt clasts set in a highly oxidized friable matrix.
Unit type: massive; unit may be transitional
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15% – 2-4 mm – equant –
no observed spinel inclusions, although the oxidized nature of the olivines may mask the spinels; olivine phenocrysts are partially oxidized and/or iddingsitized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 to 5R 4/2 – **Structures:** – **Sorting:** –
Vesicles: 5-20% – 1-5 mm – subrounded to subangular – equant to elongate –
From R236-0.0 to R237-1.5, vesicle vol.% decreases and vesicle size generally increases
Alteration: slightly to moderately (2-40% altered) –
alteration consists of groundmass oxidation
Veins: none
Fractures: moderately to highly fractured: see photo for location of rubble zones
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 99

Contacts: Top (ft): (R 237-1.5-1624.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
flow contact described in the unit 1 description
Unit type: aa
angular clasts set in a highly oxidized and baked friable matrix (see photo); clasts vary in size from <5 mm to tens of mm
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 3-5 mm – equant –
The small size of most of the clasts made it difficult to determine the mode; mode taken from box 182, unit 1 description. Olivines are almost completely oxidized.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 5/4 – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-2 mm – subrounded to subangular – equant to elongate –
vesicle measurements taken from clasts
Alteration: very highly (80-95% altered) –
oxidation is the form of alteration
Veins: none
Fractures: rubble: see photo
Additional comments:



Box #:	Cores in box
182	238 239

Loggers:	MBB
Date logged:	11/20/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1629.0
Driller's depth:bottom [feet]:	1638.4
Core type:	HQ
Units in box:	1

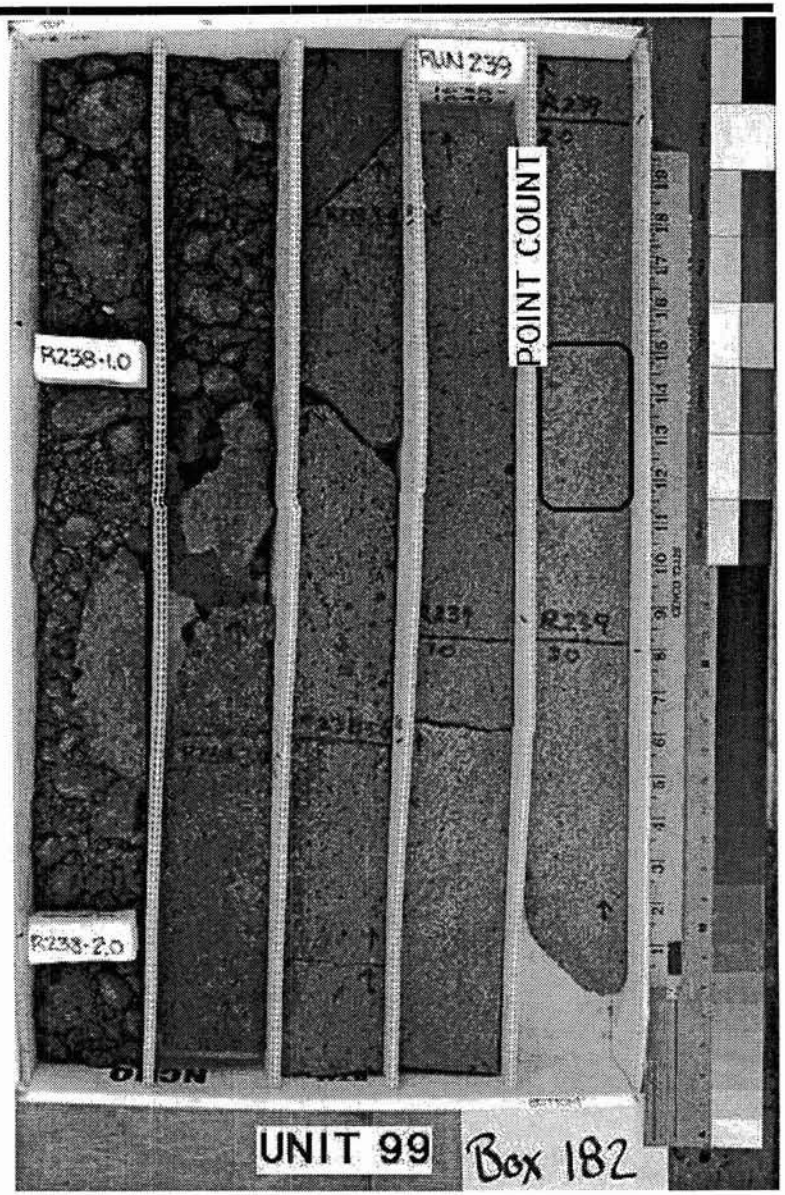
BOX UNIT 1: highly olivine phyric basalt **UNIT #:99**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
Below R238-4.0, the unit is massive; above R238-4.0 it consists of angular and subangular basalt clasts (partially oxidized) and oxidized olivines (black coloration) set in a friable, completely oxidized and baked matrix.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 18% – 2-4 mm – equant to tabular –
18% at R239-2.5; olivine phenocrysts contain spinel inclusions and occur as crystal clots; some olivine phenocrysts >5 mm; alteration includes oxidation and development of iddingsite.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 2-10% – 1-3 mm – subrounded – equant to elongate–
Clasts have a higher vesicle vol.% than the massive portion of the section.
Alteration: fresh to very highly (<2-95% altered) –
Extent of oxidation decreases from top of box to R239-1.0, where the core is essentially fresh.
Veins: none
Fractures: weakly fractured: 4/6.2 ft; above R238-3.0 unit is rubbly
Additional comments:
minor NaCl ppt, interior of flow fresh



Box #: 183

Cores in box
239
240

Loggers: MBB
Date logged: 11/20/93
Checked by: MG
Check date: 12/12/93

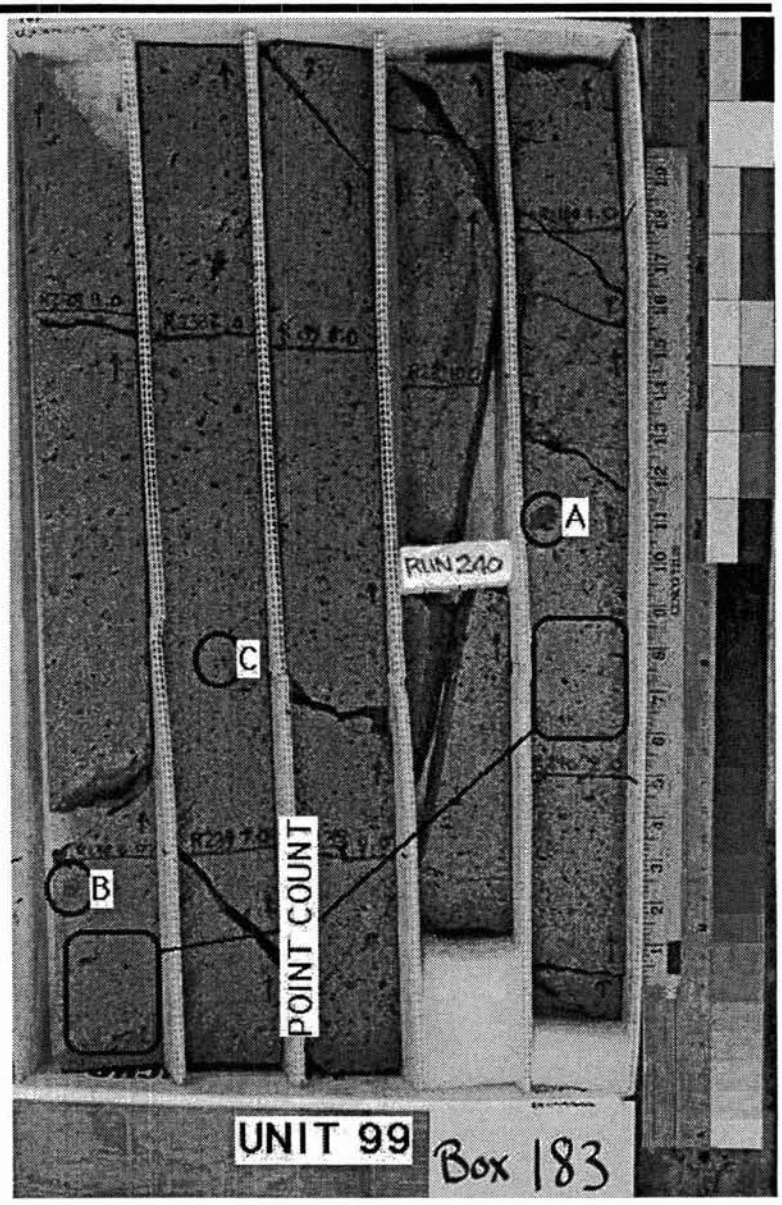
Driller's depth:top [feet]: 1638.4
Driller's depth:bottom [feet]: 1647.5
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:99

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
massive interior portion of an aa flow
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 11-15% – 2-4 mm – equant to tabular –
15% at R239-5.2; 11% at R240-1.8; olivine phenocrysts contain spinel inclusions; occur as crystal clots; rare olivines are >5 mm; degree of olivine oxidation increases from top to bottom of box, by R239-8.0 olivines have iridescent oxide (MnO) coating and are sometimes partially iddingsitized.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 2-7% – 1-5 mm – subrounded to subangular – equant to horizontally elongate –
Alteration: fresh to moderately (<2-40% altered) –
groundmass oxidation increases from top to bottom of box
Veins: none
Fractures: weakly fractured: 10/9.2 ft; some fracture surfaces display a reddish discoloration
Additional comments:
NaCl ppt
see photo: "A" = oxidized and vesicular basalt inclusion; "B" = ultramafic inclusion (dunite?); "C" = altered microgabbro (?) clot.



Box #:	Cores in box
184	240 241

Loggers:	MBB
Date logged:	11/20/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1647.5
Driller's depth:bottom [feet]:	1656.7
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 99

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R240-4.0-1649.3')(flow contact)
Flow contact defined by a highly oxidized/baked zone (aeolian material or ash?) at the top of the lower flow. This baked zone lies atop oxidized vesicular material. The bottom of the upper flow consists of a zone of clinker material.

Unit type: aa

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~15% – 2-3 mm – equant to tabular –
15% at R290-3.0; olivines contain spinel inclusions and are partially altered to iddingsite.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N3 dark gray – **Structures:** – **Sorting:** –

Vesicles: 2-5% – 1-2 mm – subrounded – –
vesicle surfaces have red (iron-oxide) coatings

Alteration: slightly to moderately (2-40% altered) –

Veins: none

Fractures: Moderately fractured core grades into rubbly clinker zone at very base of flow (see photo). Fracture surfaces are oxidized.

Additional comments:
gabbroic inclusion at 240-2.8

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 100

Contacts: Top (ft): (R 240-4.0-1649.3')(flow contact)
Bottom (ft): (R--')(continuous with next box)

Unit type: pahoehoe
pahoehoe implied by the lack of a weathered clast-rich zone at the top of the flow and the absence of a massive vesicle-free interior zone.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 12-15% – 2-4 mm – equant to tabular –
12% at R240-6.0; 15% at R241-1.5. Olivines contain rare spinel inclusions. Near the contact, olivines are completely oxidized; they are relatively fresh below R240-6.0.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray– **Structures:** – **Sorting:** –

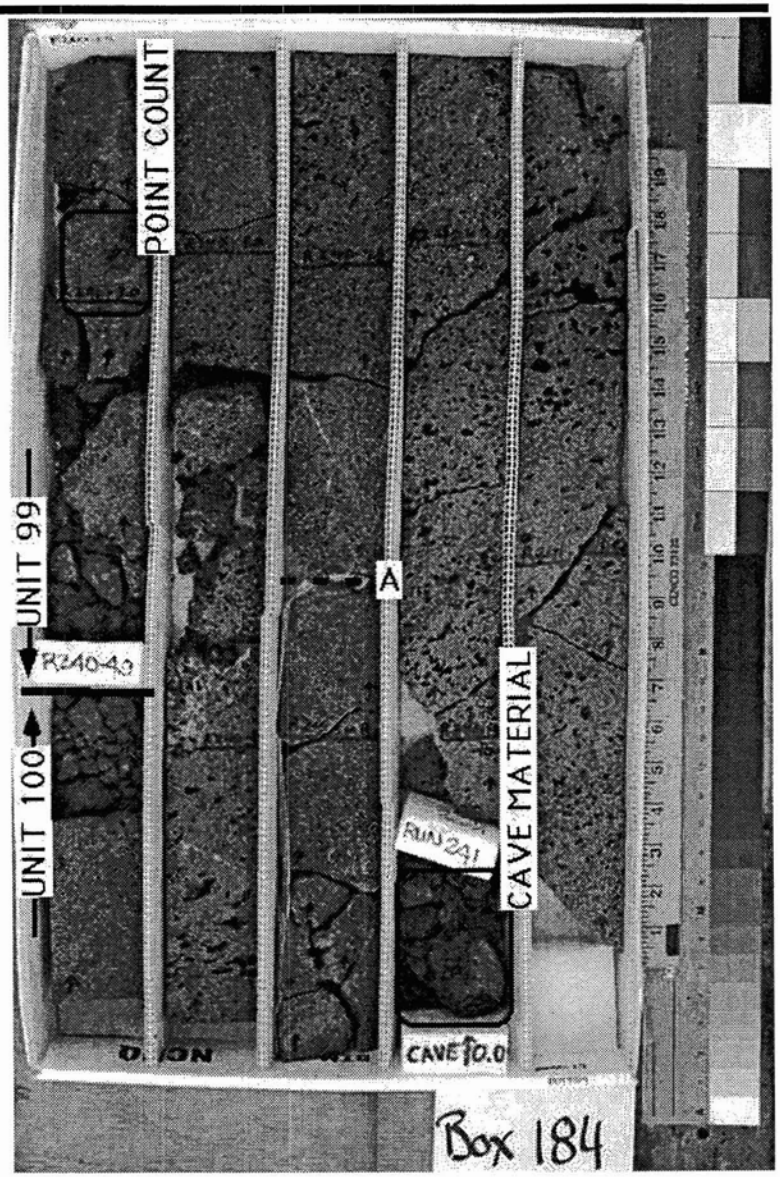
Vesicles: 5-30% – 1-5 mm – rounded to subrounded – equant to subhorizontally elongate –
Vesicle size and vol.% are inversely correlated; highest vol.% near internal flow contact (labeled "A" on photo).

Alteration: fresh to very highly (<2-95% altered) –
Extent of groundmass oxidation decreases down section from contact; groundmass has lost reddish tint by R240-9.0.

Veins: none

Fractures: weakly fractured: 18/6.9 ft; measurement doesn't include rubbly zones marked on photo; white/yellow clays(?) on some fracture surfaces

Additional comments:
NaCl ppt. "A" = possible internal flow contact, vesicle size increases in both directions away from this contact.
Cave at top of R241; piece at bottom of R240 fits together with piece at top of R241.



Box #:	Cores in box
185	241 242

Loggers:	MBB
Date logged:	11/20/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1656.7
Driller's depth:bottom [feet]:	1666.5
Core type:	HQ
Units in box:	3

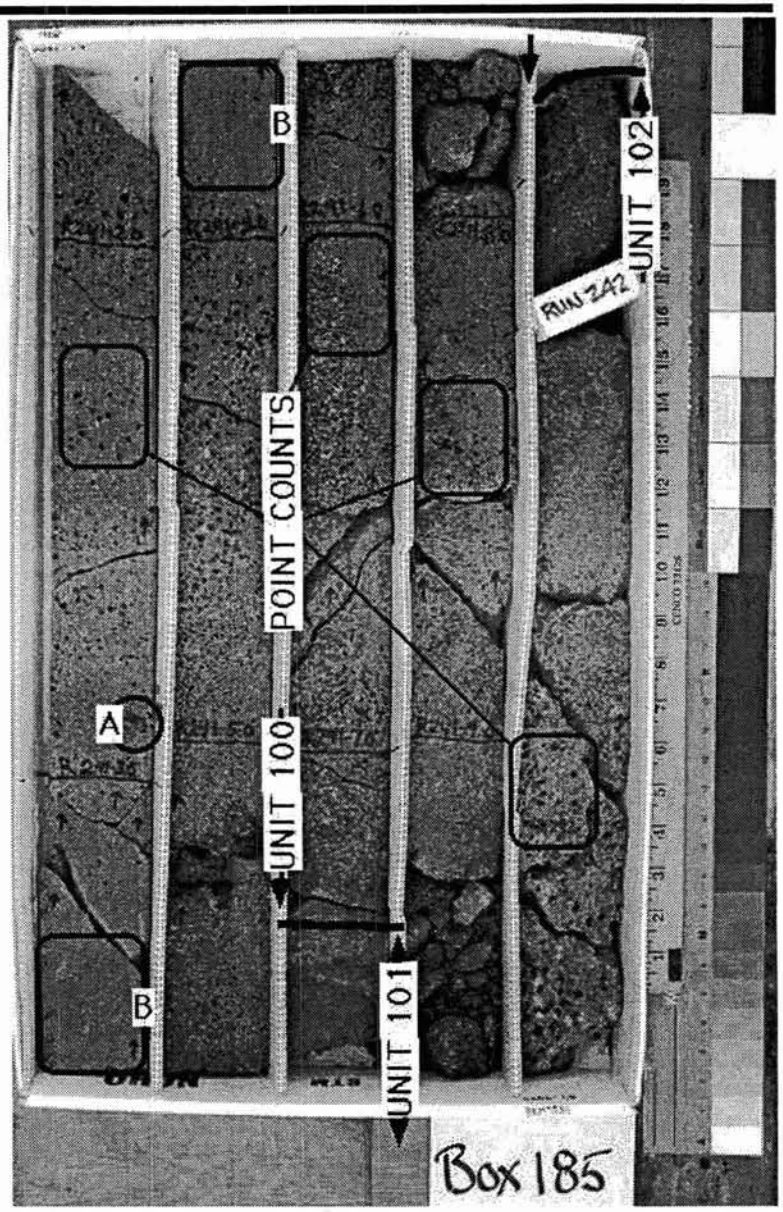
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 100

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R241-7.3-1662.8')(flow contact)
Flow contact defined by decrease in vesicle size and at the top of the lower unit a baked zone of highly weathered material (clay-rich?) with inclusions of less weathered basalt clasts and olivines (implies that this zone is not an ash layer - may be aeolian).
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 2-4 mm – equant to tabular –
14% at R241-2.4; 12% at R241-6.2; olivines contain spinel inclusions and occur in crystal clots. Rare olivines >5 mm in longest dimension. Olivines are fresh.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: <1-20% – 1-5 mm – sub-rounded – equant to elongate –
see additional comments
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 11/5.6 ft; ivory-colored material (clay?) on fractured surfaces
Additional comments:
"A" = ultramafic inclusion (appears highly oxidized - dunite?). "B" = vesicle-free zone; proportion of vesicles increases in both directions away from this zone; vol.% and size are roughly inversely correlated. NaCl ppt. Gabbro inclusion at R241-3.3.

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 101

Contacts: Top (ft): (R 241-7.3-1662.8')(flow contact)
Bottom (ft): (R241-9.5-1665.0')(flow contact)
See unit 1 description of top contact; lower contact defined by decrease in vol.% of vesicles and rubbly zones above the contact and friable oxidized zone below the contact (not strongly baked).
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 30% – 2-4 mm – equant to tabular –
30% at R241-8.5; olivines contain spinel inclusions and occur in crystal clots; olivines are fresh in the interior of the flow.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: ~10% – 1-5 mm – subrounded – equant to sub- horizontally elongate –
vesicle size decreases toward contacts
Alteration: slightly to highly (2-80% altered) –
completely altered at top contact - weathered to clays; groundmass is slightly oxidized in the interior of the flow
Veins: none
Fractures: Rubble zones at top and bottom of flow; interior 1.4' section is moderately fractured. Clay (?) on fractured surfaces.
Additional comments:

BOX 185 CONTINUED ON NEXT PAGE



Box #:	Cores in box
185	241 242

Loggers:	MBB
Date logged:	11/20/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1656.7
Driller's depth:bottom [feet]:	1666.5
Core type:	HQ
Units in box:	3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 102

Contacts: Top (ft): (R 241-9.5-1665.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 2 for a description of flow contact.

Unit type: massive

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25% – 2-4 mm – equant to tabular –
25% at R242-0.9; olivine phenocrysts contain spinel inclusions; olivines are partially oxidized and iddingsitized.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium gray– **Structures:** – **Sorting:** –

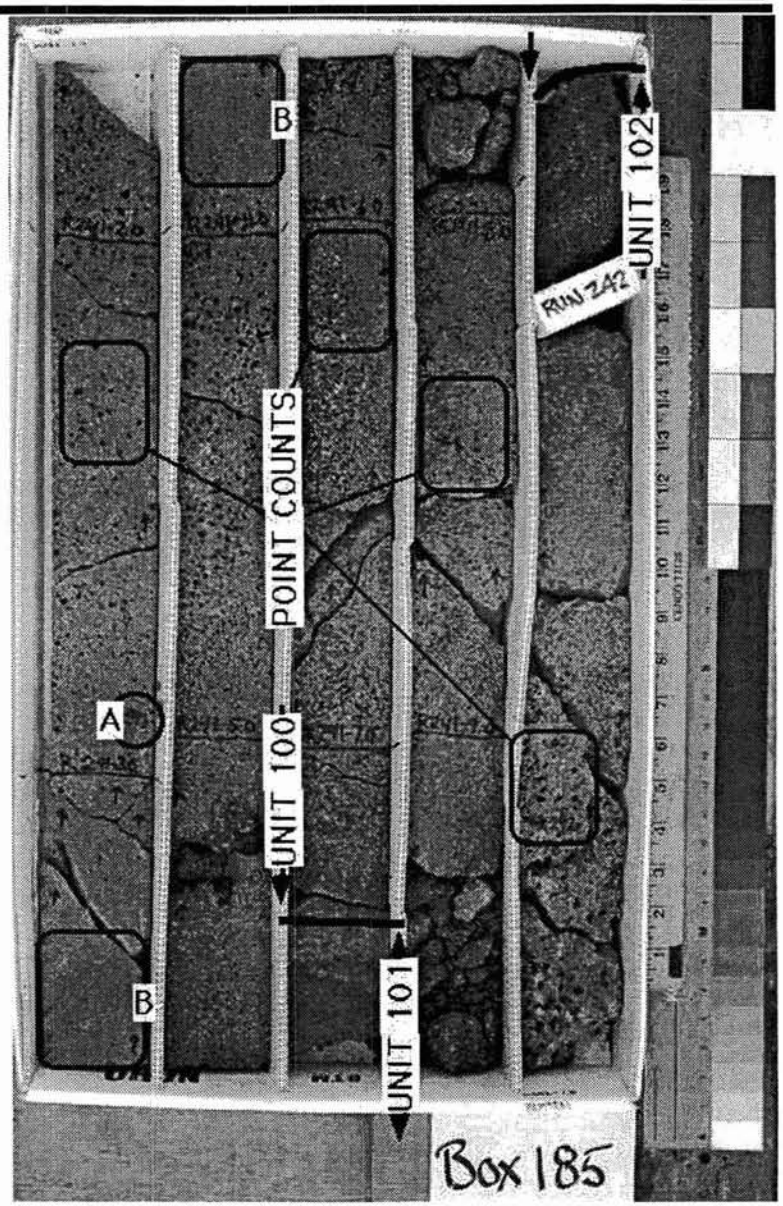
Vesicles: 10-20% – 2-10 mm – sub-rounded – equant to elongate–
Vesicles increase in size from R242-0.6 to bottom of box.

Alteration: slightly to highly (2-80% altered) –
Extent of weathering and oxidation decreases away from contact; clays present in the zone just below the lower contact; alteration is only slight by R242-0.6.

Veins: none

Fractures: weakly fractured: 9/2.9 ft; ivory-colored clays (?) present on some fractured surfaces

Additional comments:



Box #: 186

Cores in box: 242

Loggers: JCL
Date logged: 11/21/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1666.5
Driller's depth:bottom [feet]: 1674.4
Core type: HQ

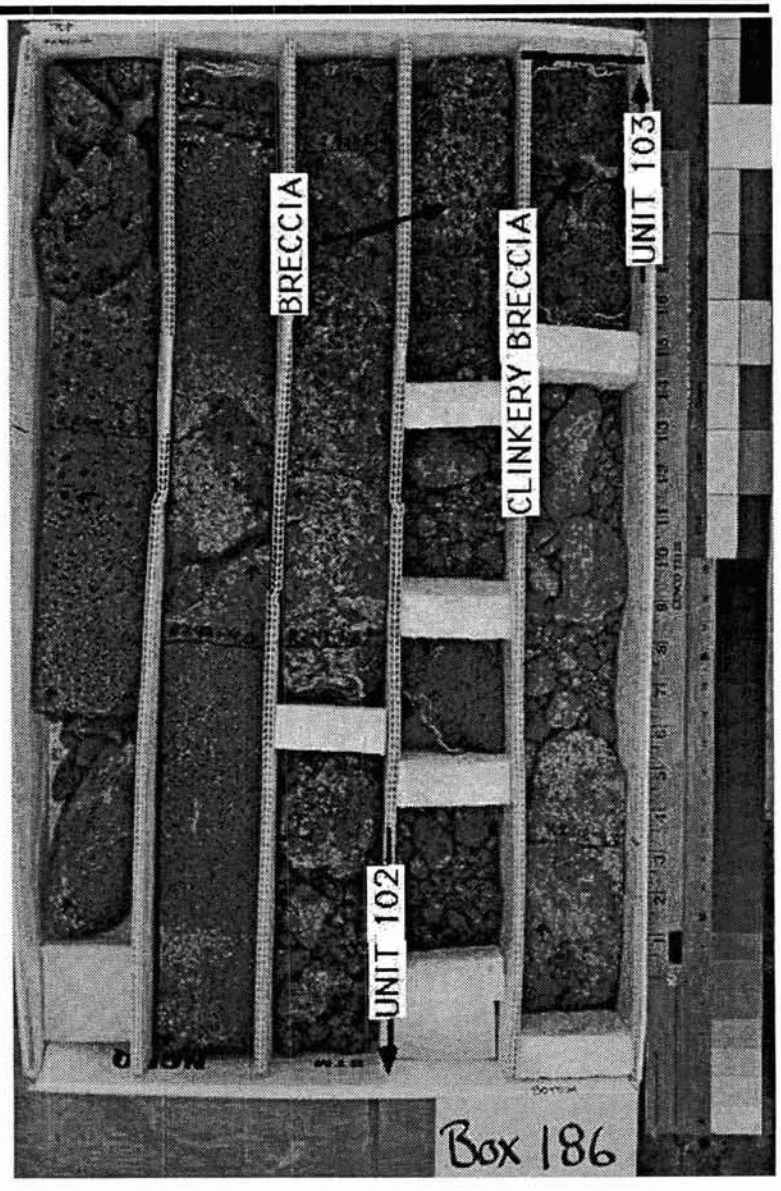
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 102

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R242-7.7-**1673.2**')(flow contact)
Bottom depth is approximate. Unit becomes rubbly, highly altered, but no clear baked zone below is visible. Some vesicular, clinkery breccia present near upper contact of lower unit.
Unit type: massive
grades to rubbly (aa?) breccia near lower contact
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-30% – 2-6 mm – blocky (<3:1:1) –
24% at R242-2.2. Olivines are mostly fresh, though some are partially iddingsitized, especially along rims.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1-5 mm – rounded – equant to horizontally elongated –
vesicles become smaller and more numerous with depth
Alteration: fresh (<2% altered) –
Unit becomes increasingly altered with yellow-white clay lining fractures and partially infilling vesicles near lower contact.
Veins: none
Fractures: weakly fractured (7/2 ft), grading to highly fractured/rubble near lower contact
Additional comments:

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 103

Contacts: Top (ft): (R 242-7.7-**1673.2**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Not much of a baked zone visible at upper contact, but some clinkery, vesicular breccia and decrease in olivine content suggest flow contact/unit contact.
Unit type: rubble-aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-5 mm – blocky (<3:1:1) – iddingsite
14% at R242-9.0. Generally iddingsitized and/or oxidized.
– – – –
– – – –
Groundmass/Matrix: microcrystalline (see below) –
Color: 5YR 6/1 light brownish gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-10 mm – irregular – inclined 45° –
mostly too altered with clay,etc., to determine vesicle content, orientation, etc.
Alteration: moderately to highly (10-80% altered) –
substantial gray clay coating/cementing fine rubble
Veins: none
Fractures: highly fractured/rubble
Additional comments:
Original groundmass is mostly too altered to determine grain size. Larger pieces appear to be microcrystalline.



Box #:	Cores in box
187	242 243

Loggers:	MBB
Date logged:	11/21/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1674.4
Driller's depth:bottom [feet]:	1683.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:103**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: massive (aa?)
R242-9.4 to R243-0.0 relatively unoxidized angular basalt clasts set in a weathered, but not highly oxidized, friable matrix; some clay(?) material present. Below R243-0.0 material is largely massive, except for two rubbly zones starting at R243-1.6 and R243-2.2.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~20% – 2-5 mm – equant to tabular –
20% at R243-3.4; 21% at R243-7.7; rare spinel (?) inclusions in olivine phenocrysts; olivines occur as crystal clots. Olivines throughout box are oxidized (sometimes completely) and are partially iddingsitized.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N3 - 5R4/2 – **Structures:** – **Sorting:** –

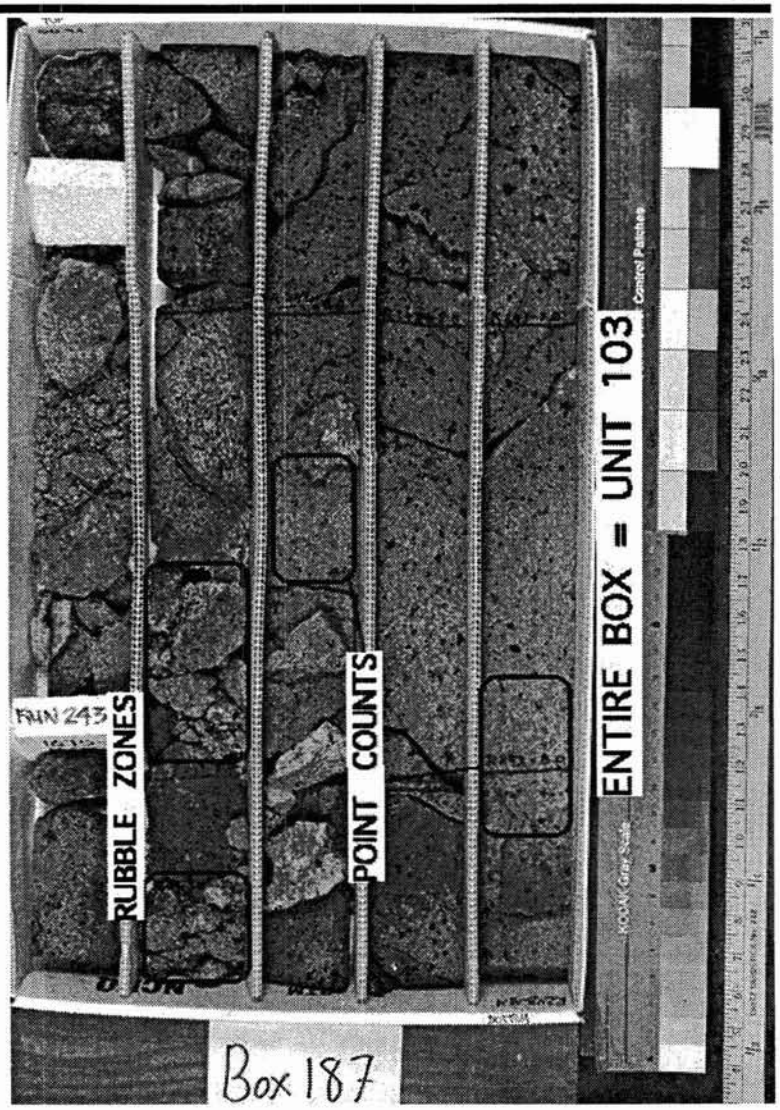
Vesicles: 5-10% – 1-5 mm – subrounded to subangular – equant to elongate –
From R243-0.0 to R243-8.4 (end of box) vesicle vol.% decreases as the size increases.

Alteration: moderately to very highly (10-95% altered) –
Degree of weathering decreases from R242-9.4 (top of box) to R243-0.0; below R243-0.0 groundmass shows moderate degrees of oxidation.

Veins: none

Fractures: weakly fractured: 25/8.5 ft; measurement does not include the two rubbly zones below R243-0.0 (see photo). Clay (?) on some fracture surfaces.

Additional comments:
NaCl ppt



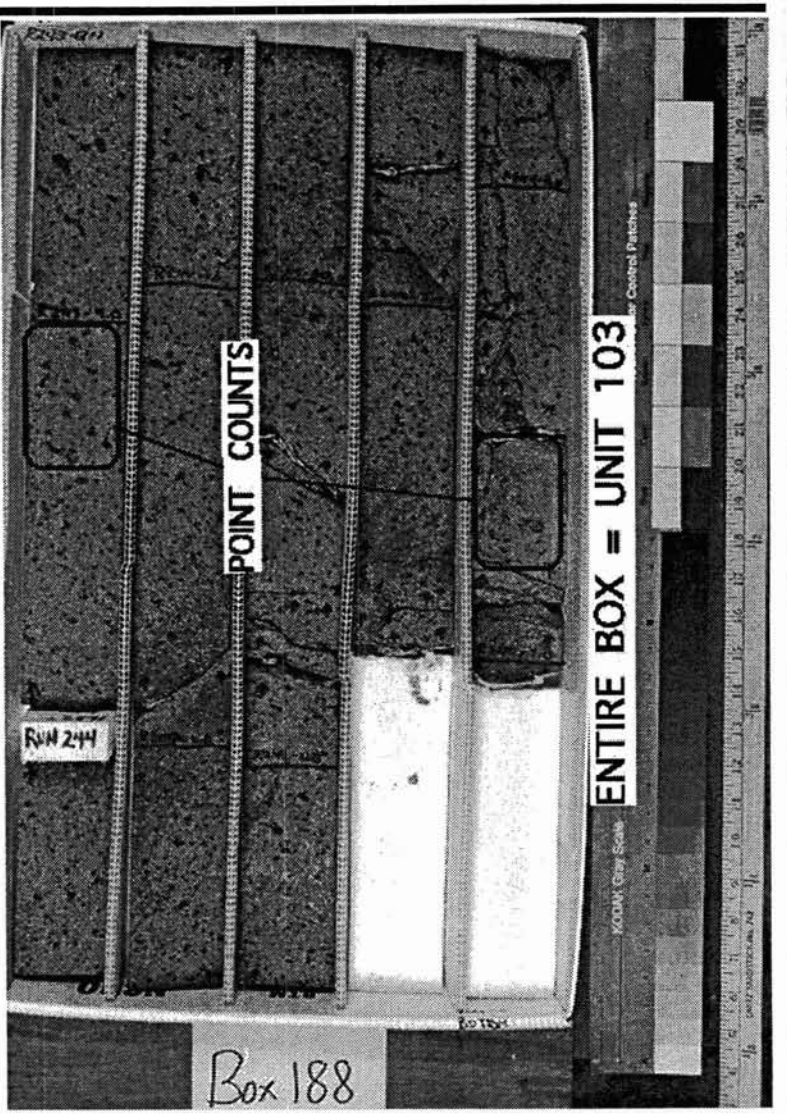
Box #:	Cores in box
188	243 244

Loggers:	MBB
Date logged:	11/21/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1683.6
Driller's depth:bottom [feet]:	1692.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:103**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 18-20% – 2-5 mm – equant to tabular –
20% at R243-9.2; 18% at R244-6.7; rare spinel inclusions in olivine phenocrysts, olivines occur in crystal clots. Between R243-8.4 and R244-0.5 olivines are quite fresh; from R244-0.5 to bottom of box, olivines are variably oxidized and display minor iddingsite alteration.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 3-5% – 2-5 mm – subrounded to subangular – equate to sub- horizontally elongate –
Vesicle size and vol.% is homogeneous throughout section.
Alteration: slightly (2-10% altered) –
Groundmass shows variable degrees of oxidation.
Veins: none
Fractures: weakly fractured: 20/8.4 ft; ivory-colored soft material (clay?) occurs as filaments on the surfaces of some vesicles
Additional comments:
NaCl ppt



Box #:	Cores in box
189	244 245

Loggers:	MBB
Date logged:	11/21/93
Checked by:	MG
Check date:	12/12/93

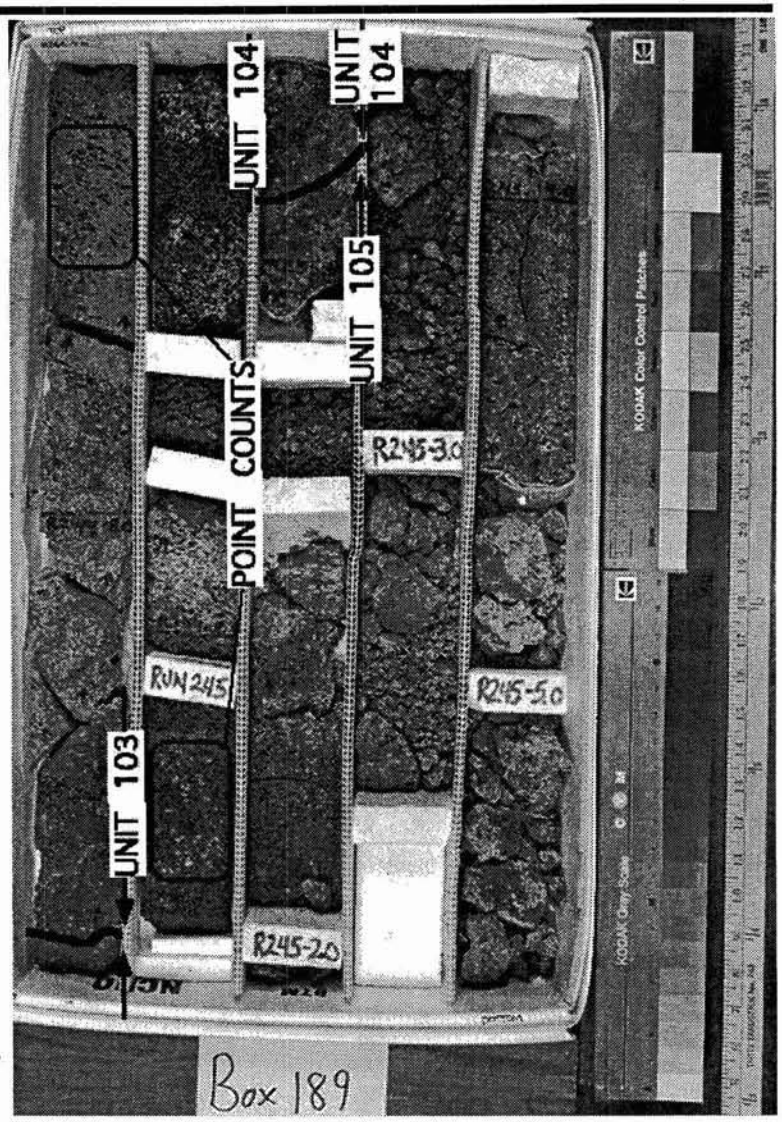
Driller's depth:top [feet]:	1692.0
Driller's depth:bottom [feet]:	1701.0
Core type:	HQ
Units in box:	3

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 103

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R244-8.9-1694.4')(flow contact)
Flow contact defined by a sharp change from relatively massive unoxidized material to oxidized highly vesicular material as well as a lithologic change (from highly to moderately phyric). Right at the contact there is a bright red baked zone (~2-3 mm in thickness).
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~30% – 2-4 mm – equant –
30% at R244-7.3; no obvious spinel inclusions in the olivine phenocrysts; olivines are present in crystal clots. Olivines exhibit only slight oxidation.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – subrounded to subangular – equant to horizontally elongate –
Vesicle vol.% decreases below R244-7.5.
Alteration: slightly to moderately (2-40% altered) –
groundmass oxidation
Veins: none
Fractures: weakly fractured: 5/1.9 ft; some of the fracture surfaces have a reddish iron-oxide discoloration
Additional comments:
Core becomes more friable below R244-7.5.

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 104

Contacts: Top (ft): (R 244-8.9-1694.4')(flow contact)
Bottom (ft): (R245-0.8-1696.3')(flow contact)
See unit 1 for a description of top contact. Base marked by 1 mm thick, discontinuous glass layer.
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 7% – 2-4 mm – equant to tabular –
7% at R245-0.3
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 3/4 dark reddish brown – **Structures:** – **Sorting:** –
Vesicles: 10-30% – 1-5 mm – subrounded to subangular – –
clay(?) on the basalt surfaces inside the vesicles
Alteration: moderately to very highly (10-95% altered) –
Extent of groundmass oxidation decreases away from contact; material from R245-4.0 to R245-4.6 is the least oxidized portion of the section.
Veins: none
Fractures: ~50% of core below contact is rubbly; remaining core consists of 0.4 to 0.7' pieces with 0-3 fractures/piece.
Additional comments:



BOX 189 CONTINUED ON NEXT PAGE

Box #:	Cores in box
189	244 245

Loggers: MBB
Date logged: 11/21/93
Checked by: MG
Check date: 12/12/93

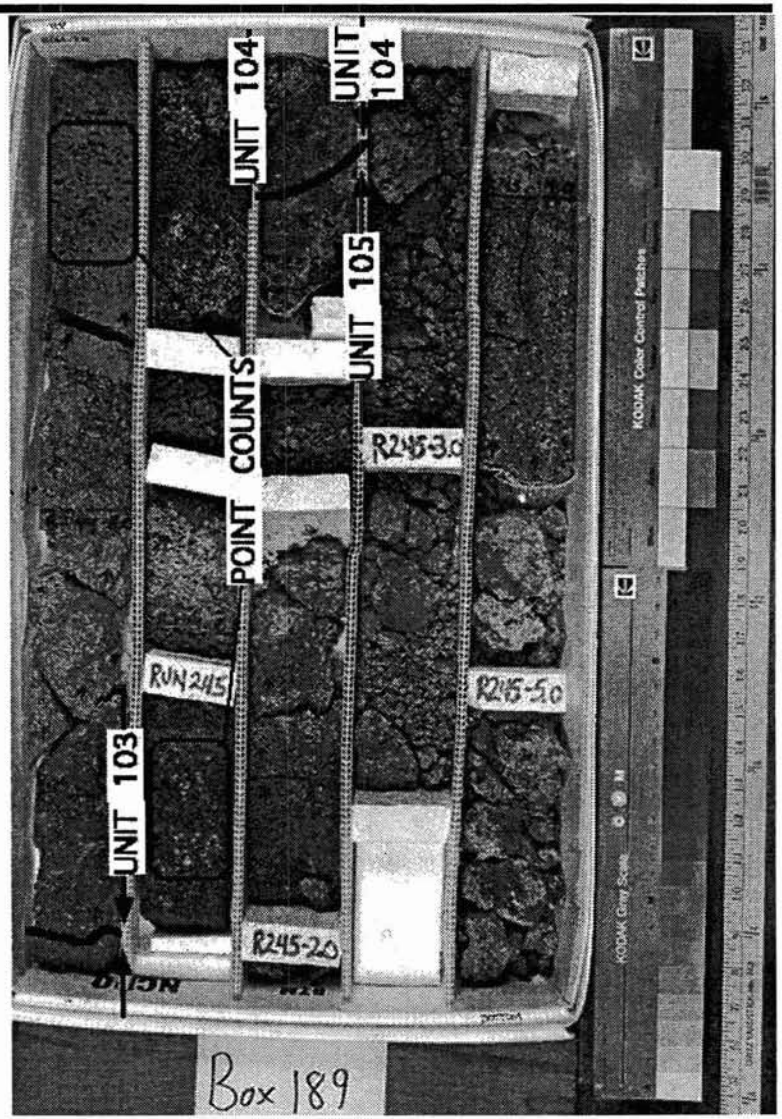
Driller's depth:top [feet]: 1692.0
Driller's depth:bottom [feet]: 1701.0
Core type: HQ

Units in box: 3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 105

Contacts: Top (ft): (R 245-0.8-1696.3')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-3 mm – equant to blocky –
12% at R245-4.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-4 mm – sub-rounded – horizontally elongated–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: moderately
Additional comments:



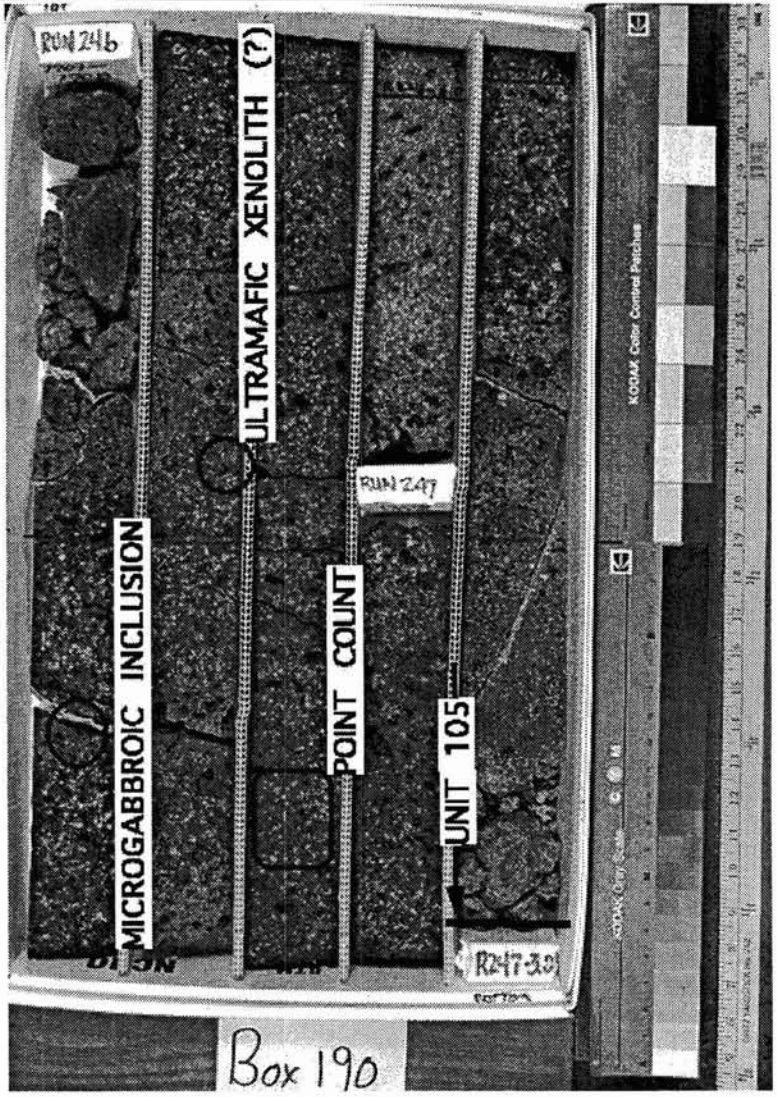
Box #:	Cores in box
190	246 247

Loggers:	JCL
Date logged:	11/21/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1701.0
Driller's depth:bottom [feet]:	1711.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:105**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R247-3.0-1710.9')(flow contact)
Unit type: massive
transitional top
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-5 mm – blocky (<3:1:1) – iddingsite (minor)
15% at R246-5.6. Some spinel inclusions. Minor weathering of some grains.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – >5 mm – rounded – horizontally to vertically elongated–
Vesicles become smaller, more equant, and more numerous near the upper and lower flow boundaries. Sub-population of equant microvesicles present throughout.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: Weakly fractured: 10/9 ft; except for highly fractured/rubbly zone at top and bottom of unit. Some fractures have soft yellowish coating and minor infilling of surrounding vesicles.
Additional comments:
Lots of NaCl ppt on dried surfaces. 3 cm microgabbroic inclusion at R246-1.4 along fracture and at R246-3.1 on back side of core. Possible ultramafic xenolith at R246-2.8.



Box #: 191

Cores in box: 247, 248

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/12/93

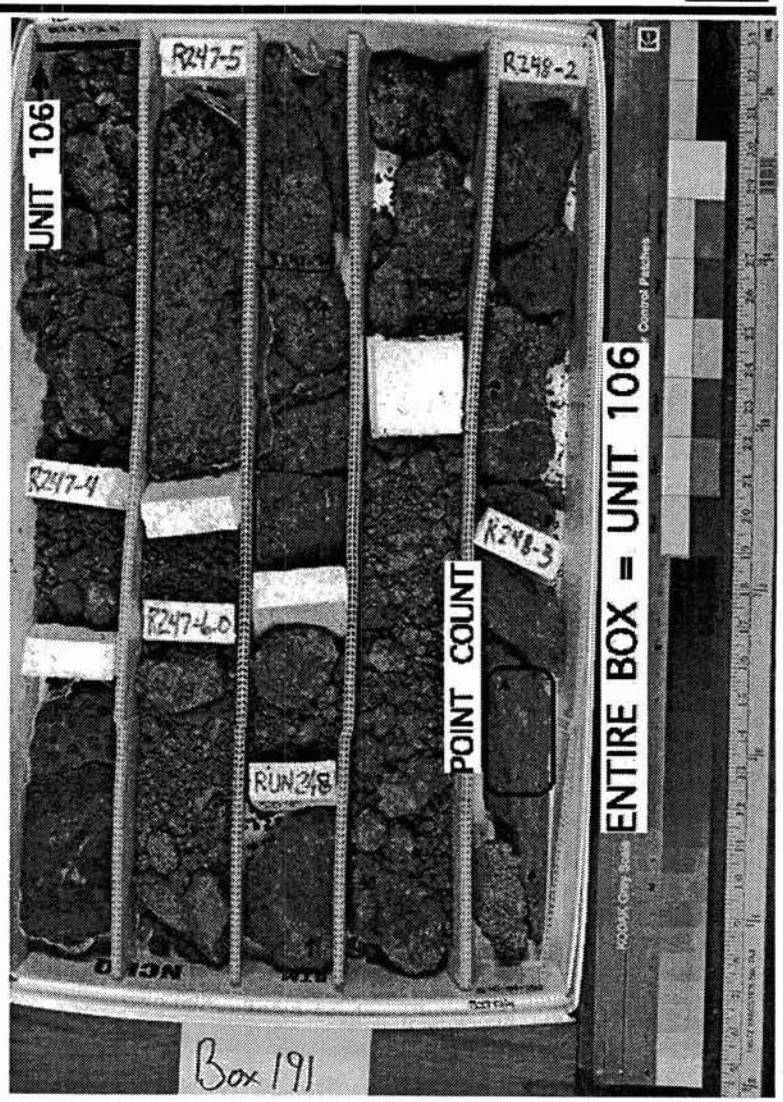
Driller's depth:top [feet]: 1711.0
Driller's depth:bottom [feet]: 1720.0
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:106

Contacts: Top (ft): (R 247-3.0-1710.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red rubble zone at top of box
Unit type: aa
mixed rubbly and massive portions; rubbly areas are red
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant –
200 pts counted at R248-3.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 3/4 dusky red – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-3 mm – sub-angular – vertically elongated –
Alteration: moderately (10-40% altered) – clay
oxidation
Veins: none
Fractures: rubble
Additional comments:
NaCl ppt at R247-5.0; box of rubbly material with coherent clasts 0.5 ft across



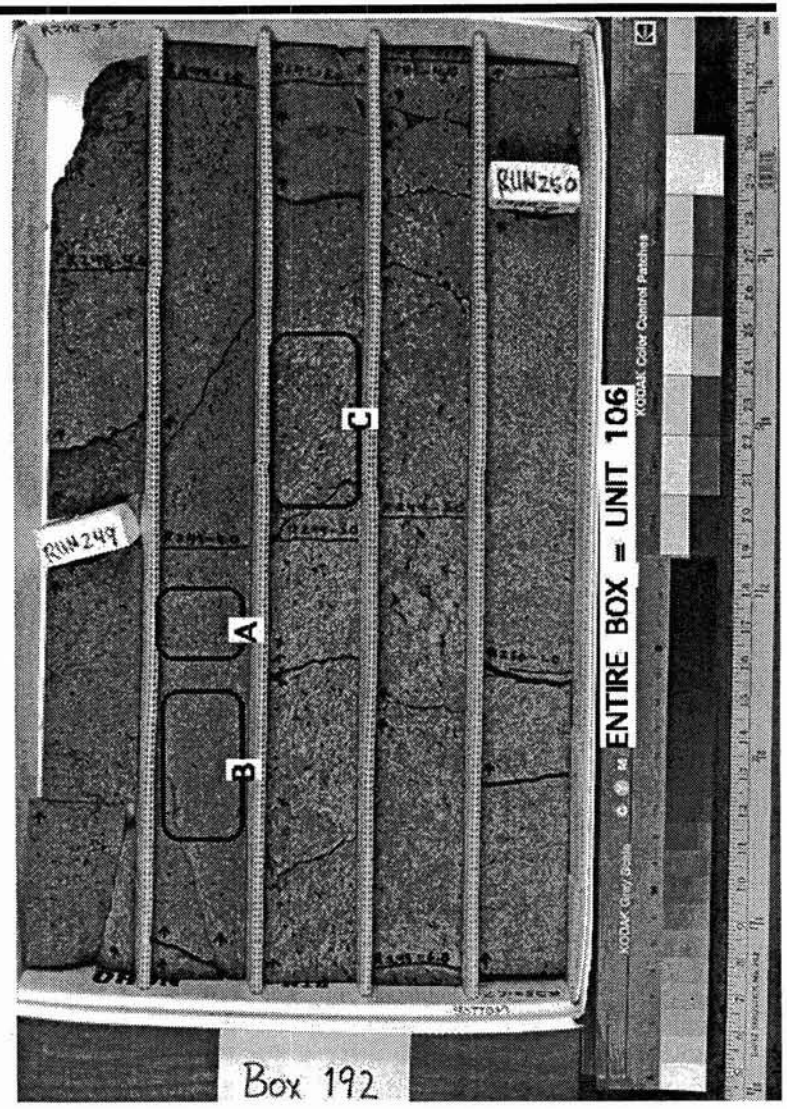
Box #:	Cores in box
192	248 249 250

Loggers:	JCL
Date logged:	11/21/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1720.0
Driller's depth:bottom [feet]:	1730.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately to highly olivine phyric basalt **UNIT #:106**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately to highly phyric – 8-12%
olivine – 8-12% – 1-5 mm – blocky (<3:1:1) –
11% at 249-0.4, 9% R250-0.4. Slightly oxidized/iddingsitized near top of box, decreasing with depth.
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: 5YR 6/1 light olive gray – **Structures:** – **Sorting:** –
Vesicles: 5-20% – <1-5 mm – sub-angular – inclined–
Some internal banding in terms of vesicle size/abundance. See zones A, B, and C in photo.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 19/10 ft
Additional comments:
NaCl ppt on dried surfaces. A=zone with small, abundant vesicles B=vesicle-poor zone C=zone with large (1-5 mm) irregular vesicles.



Box #: 193

Cores in box
250
251

Loggers: MBB
Date logged: 11/22/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1730.1
Driller's depth:bottom [feet]: 1740.6
Core type: HQ

Units in box: 2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 106

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R250-7.5-1735.2')(flow contact)
Flow contact defined by sharp change from massive material to highly weathered rubbly material. Clay material at the contact (in the lower unit) appears baked.

Unit type: aa
unit type interpretation based on strongly sheared horizontally elongate vesicles

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – ~9% – 2-4 mm – equant to tabular –
9% at R250-3.3; 9% at R250-7.2; no obvious spinel inclusions. Olivines are relatively fresh, some oxidation coatings (MnO?) and iddingsite.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –
Color: N4 + 5R 4/2 – **Structures:** – **Sorting:** –
Vesicles: 1-5% – 3-10 mm – subangular – horizontally elongate –
ivory-colored discoloration on the interior surfaces
Alteration: slightly to moderately (2-40% altered) –
reddish tint in the groundmass increases toward contact
Veins: none
Fractures: weakly fractured: 10/5.9 ft
Additional comments:
see photo: "A" = more finely vesicular zone (autoliths?) that are more highly oxidized; plagioclase xenocryst at R250-4.6

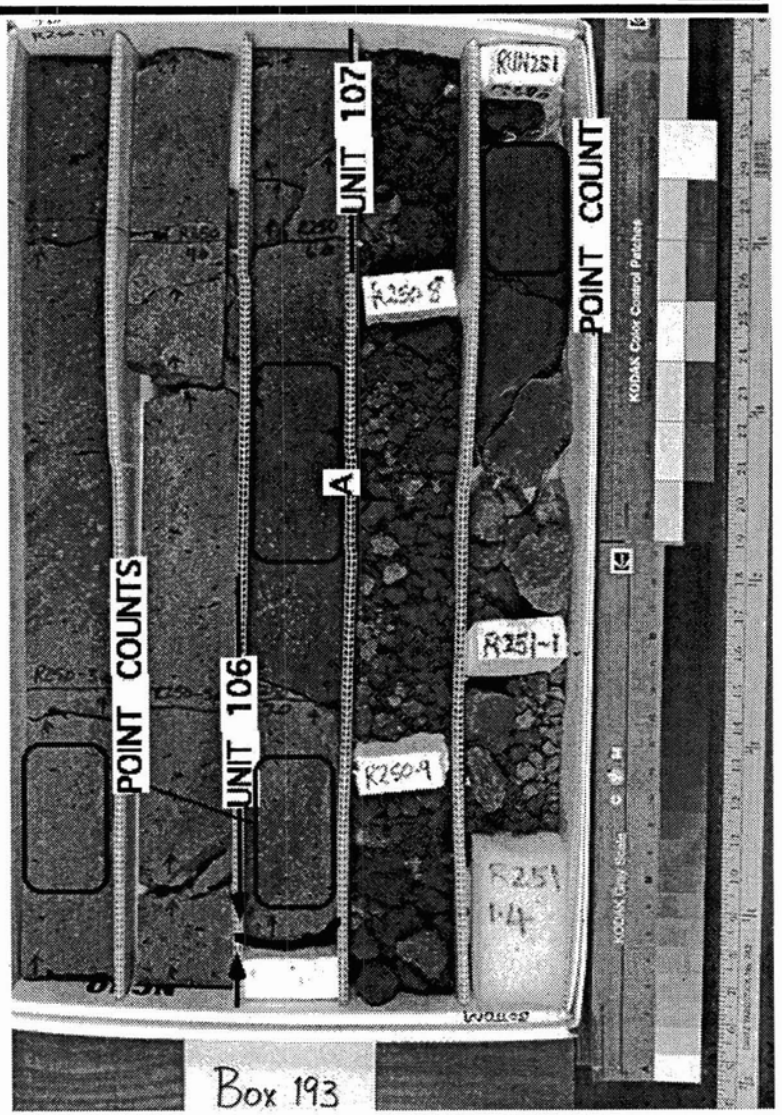
BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 107

Contacts: Top (ft): (R 250-7.5-1735.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for a description of the flow contact.

Unit type: aa
The size of the clasts increases and the extent of weathering/oxidation decreases down section.

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 2-5 mm – equant to tabular –
3% at R251-0.3; olivines are completely oxidized down to R251-0.6
– – – –
– – – –

Groundmass/Matrix: microcrystalline –
Color: 5R 3/4 + 10R 3/4 – **Structures:** – **Sorting:** –
Vesicles: 5-20% – ~1 mm – sub-rounded – equant –
clay
Alteration: moderately to very highly (10-95% altered) –
The extent of oxidation/weathering decreases down section away from the contact.
Veins: none
Fractures: rubble
Additional comments:
color determined on a piece near the contact



Box #:	Cores in box
194	251 252

Loggers:	MBB
Date logged:	11/23/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1740.6
Driller's depth:bottom [feet]:	1751.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: sparsely to moderately olivine phyric basalt **UNIT #:107**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
interpretation based on massive character of the unit and the elongate and sheared nature of the vesicles

Phenocrysts/Clasts:
sparsely to moderately phyric (1-10%) –
olivine – 1-3% – 2-4 mm – equant to tabular –
3% at R251-2.5; 1% at R252-1.5; rare spinel inclusions in the olivine phenocrysts, olivine occur in crystal clots. Olivines are quite fresh, minor blue/black iridescent coatings and some iddingsite present.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

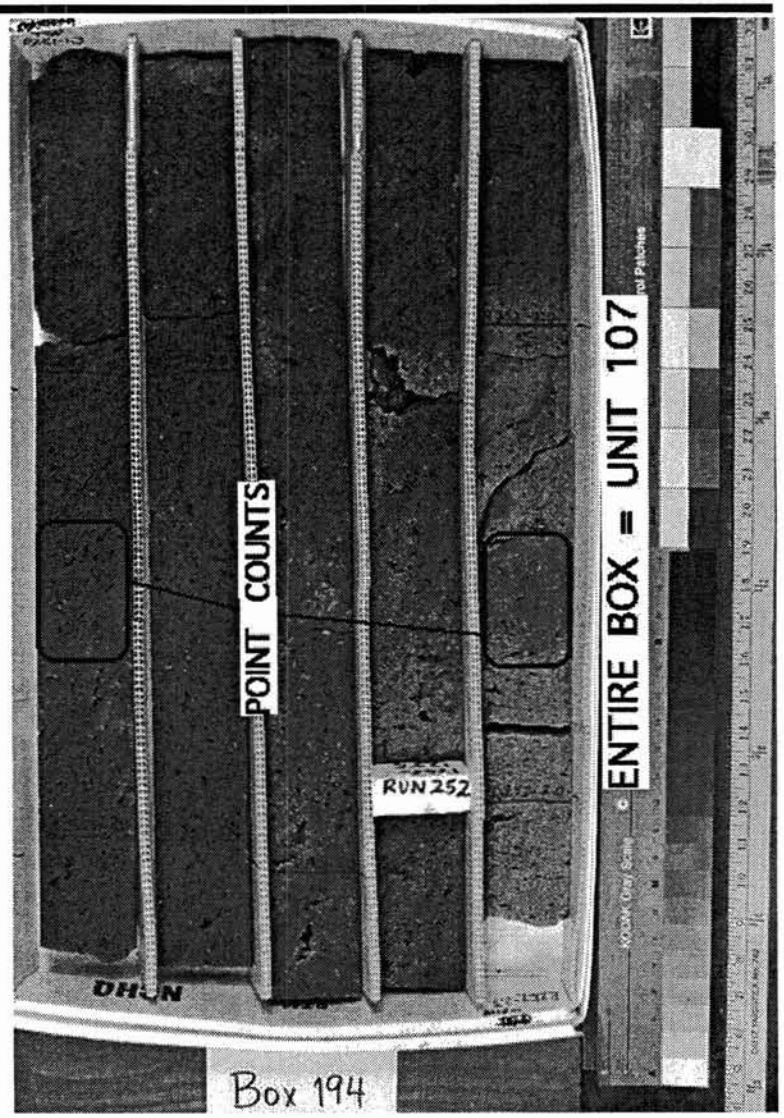
Vesicles: 5-15% – <1-10 mm – subrounded to subangular – –
two populations of vesicles: small vesicles are generally equant and subrounded; larger vesicles are more angular and elongate

Alteration: fresh (<2% altered) –
slight alteration at the top of the section (R251-1.3 to R251-2.0)

Veins: none

Fractures: weakly fractured: 9/9.7 ft; some of the fracture surfaces have a brown discoloration

Additional comments:
very rare, small (~3 mm) microgabbros (open textured)



Box #:	Cores in box
195	252 253 254

Loggers:	MBB
Date logged:	11/23/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1751.7
Driller's depth:bottom [feet]:	1763.2
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 107

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R253-1.6-**1756.6**')(flow contact)
flow contact defined by a clinkery oxidized zone at the top of the lower unit (see photo) and an increase in the proportion of olivine below the contact

Unit type: aa
unit type definition based on massive non-vesicular character of the core and the presence of highly sheared vesicles

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-3% – 2-3 mm – equant –
2.5% at R252-2.8; 3% at R253-2.2; no obvious spinel inclusions in the olivine phenocrysts. Above R253-0.0, olivines exhibit minor oxidation and iddingsite; below R253-0.0, olivines are highly to very highly altered.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium gray – **Structures:** – **Sorting:** –

Vesicles: 5-10% – <1 mm and 5-10 mm – sub-angular – equant and sub-horizontally elongate –
Equant vesicles are ≤1 mm. Vesicles with a high aspect ratio are horizontal.

Alteration: slightly to moderately (2-40% altered) –
Extent of groundmass oxidation increases toward contact; core is moderately oxidized by R253-0.0; higher degrees of groundmass oxidation correlate with higher concentrations of elongate vesicles.

Veins: none

Fractures: weakly fractured: 12/5 ft; measurement does not include rubble zone labeled "A" on photo. Light brown discoloration on some fracture surfaces.

Additional comments:
very rare plagioclase and gabbroic inclusions

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 108

Contacts: Top (ft): (R 253-1.6-**1756.6**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for a description of the flow contact

Unit type: aa

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – ~7% – 2-4 mm – equant to tabular –
7% at R254-1.7; no obvious spinel inclusions. Highly to moderately oxidized with some iddingsite developed along olivine rims and fractures. Degree of olivine alteration decreases away from contact; most altered in the interval R253-1.6 to R253-3.9.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

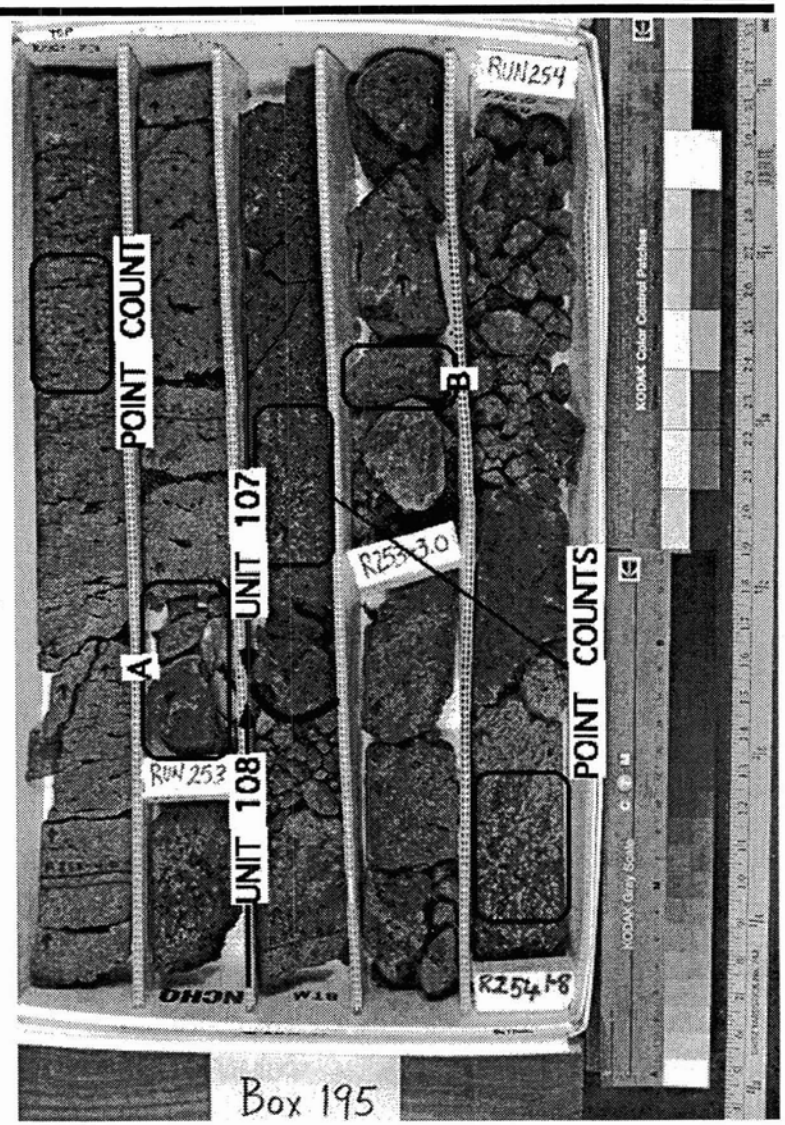
Vesicles: 5-10% – 2-5 mm – subangular to angular – equant to elongate –
in more massive portion of the section, vesicles are subvertically elongate

Alteration: slightly to highly (2-80% altered) –

Veins: none

Fractures: the section is largely rubble - see photo; ivory-colored clays are present on the surfaces many of the rubbly pieces

Additional comments:
see photo: "B" = piece with an ultramafic inclusion on the exterior cored surface; rare gabbroic clots



Box #:	Cores in box
196	254 255 256

Loggers:	MBB
Date logged:	11/23/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1763.2
Driller's depth:bottom [feet]:	1773.5
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 108

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R256-3.8-1772.8')(flow contact)
Flow contact defined by sharp transition from massive fresh material to highly oxidized rubbly material that appears baked near the contact; there is also a lithology change from moderately to highly olivine phyric.

Unit type: massive
unit maybe transitional - interpretation based on massive character of the core and the presence of both more spherical and highly elongate vesicles at the same depth

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-7% – 2-4 mm – equant to tabular –
7% at R254-4.3; 6% at R256-2.7; rare spinel inclusions in olivine phenocrysts. Throughout section, olivines are slightly to moderately oxidized and iddingsitized.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

Vesicles: 5-10% – 1-10 mm – subrounded to angular – equant to elongate –
Vesicles are sheared and subhorizontally elongate in the interval R254-1.8 to R254-6.3, subrounded and equant below the depth R256-0.0.

Alteration: fresh to slightly (<2-10% altered) –
Extent of alteration increases slightly toward contact. Groundmass has a faint reddish tint.

Veins: none

Fractures: weakly fractured: 10/7.8 ft; soft ivory-colored material (clays?) coating some fracture surfaces

Additional comments:
very minor NaCl ppt
see photo: "A" = represents either an internal rubbly zone within the flow, or, because this material occurs at the top of a run, cave material. The presence of some reworked surfaces and the different vesicle structure suggests that the material is cave.

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 109

Contacts: Top (ft): (R 256-3.8-1772.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for a description of the flow contact

Unit type: aa/transitional
The top of the flow consists of a clinkery baked zone. However some of the pieces appear to have more pahoehoe-like flow textures.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-3 mm – equant –
Visual mode. Olivines are generally completely oxidized.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: 10R 4/6 (weathered outer surface) – **Structures:** – **Sorting:** –

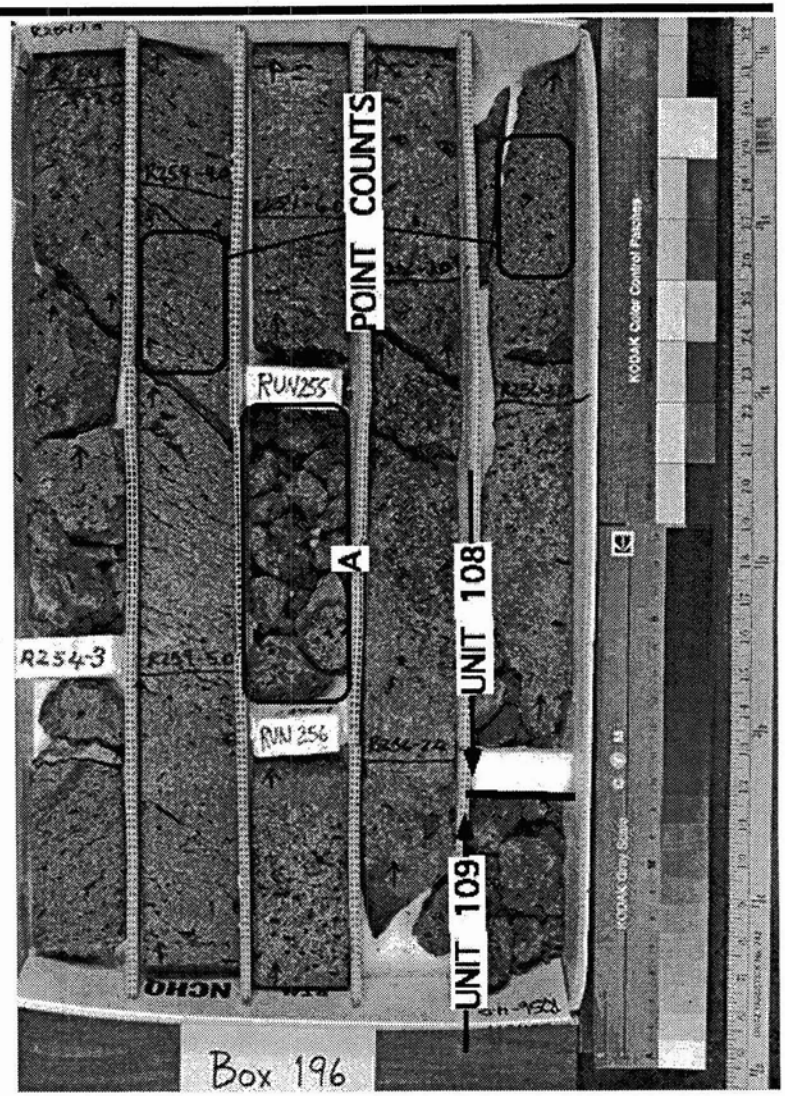
Vesicles: 5-20% – <1-2 mm – sub-rounded – equant –
clay

Alteration: highly to very highly (40-95% altered) –
weathered and oxidized

Veins: none

Fractures: rubbly - see photo

Additional comments:



Box #:	Cores in box
197	256 259 257 258

Loggers:	MBB
Date logged:	11/23/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1773.5
Driller's depth:bottom [feet]:	1782.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:109**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
Unit grades from unconsolidated clasts (<1-10 mm), to subangular clasts set in a friable matrix, to massive vesicle-poor material.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~17% – 3-5 mm – equant to tabular –
17% at R258-0.3 ; 17% at R258-3.6; no obvious spinel inclusions in the olivine phenocrysts, olivine occur in crystal clots. Rare olivines ≥10 mm in longest dimension. Olivines are slightly to moderately altered; below R257-2.0 olivines exhibit blue/black oxide coatings and minor iddingsite.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

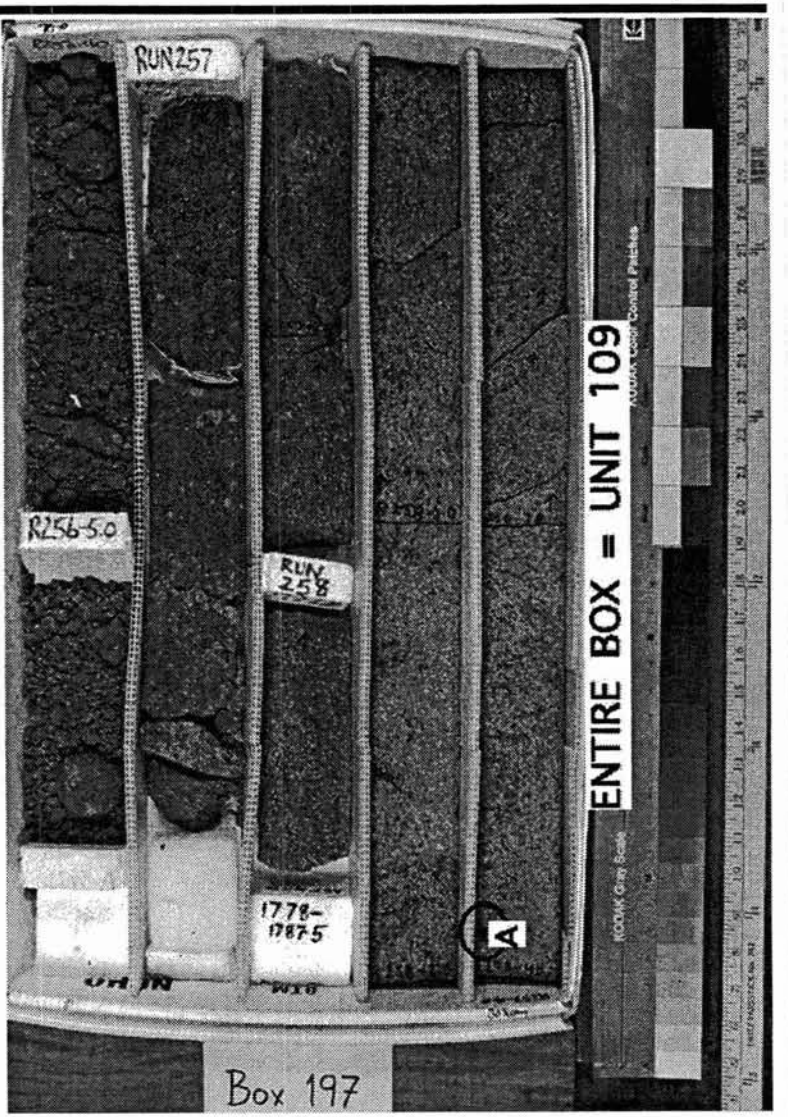
Vesicles: 3-7% – 1-5 mm – subrounded to subangular – equant to elongate –
most of the elongate vesicles are subvertical

Alteration: highly to very highly (40-95% altered) –
Extent of weathering and oxidation decreases down section. The groundmass is only slightly oxidized by R257-2.0.

Veins: none

Fractures: weakly fractured: 7/5.5 ft; measurement started at R257-1.6

Additional comments:
NaCl ppt
see photo: "A" = dunite inclusion



Box #:	Cores in box
198	259 260 261

Loggers:	MBB
Date logged:	11/23/93
Checked by:	MG
Check date:	12/12/93

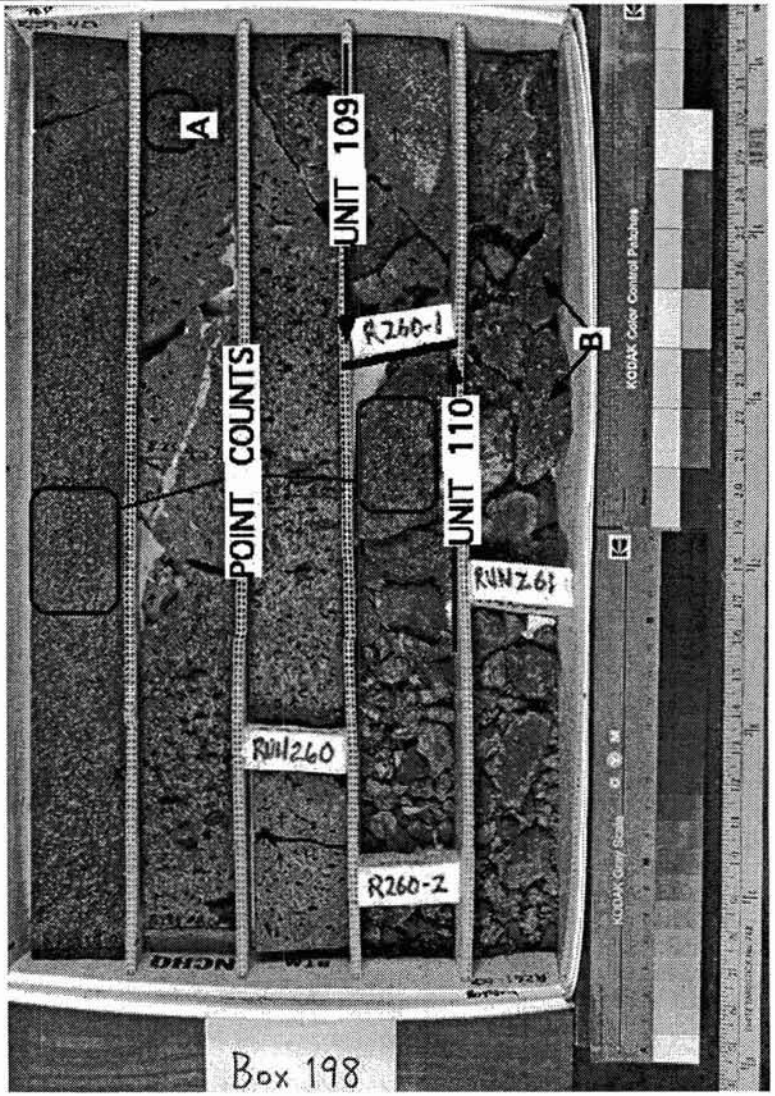
Driller's depth:top [feet]:	1782.0
Driller's depth:bottom [feet]:	1793.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 109

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R260-1.0-1788.6')(flow contact)
Flow contact defined by decrease in vesicle size in the upper unit and a ~10 mm thick clay(?) layer that is not strongly baked at the top of the lower unit. The clay(?) layer contains olivines. Below the clay(?) layer is a 2 cm thick, faintly oxidized zone. No apparent lithologic change.
Unit type: aa/transitional
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~15% – 2-4 mm – equant to tabular –
15% at R259-5.2; no obvious spinel inclusions in the olivine phenocrysts; slight olivine oxidation and iddingsite development
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 2-10% – 1-5 mm – subrounded to subangular – equant to horizontally elongate –
Vesicles increase in size and abundance below R259-6.0.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 8/6.2 ft; ivory-colored material (clay?) on some of the fracture surfaces
Additional comments:
see photo: "A" = cm-sized olivine phenocryst

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 110

Contacts: Top (ft): (R 260-1.0-1788.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for a description of the contact.
Unit type: rubble
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-3 mm – equant –
18% at R260-1.2; rare spinel inclusions in olivine phenocrysts
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant to elongate –
Alteration: slightly to moderately (2-40% altered) –
ivory-colored material (clay?) partially coating some of the rubbly pieces
Veins: none
Fractures: highly fractured/rubble
Additional comments:
"B" = pieces of more vesicular material; there maybe a thin flow in the interval R260-2.0 to R261-0.0. Some clinkery/scoriaceous material at R260-3.3.



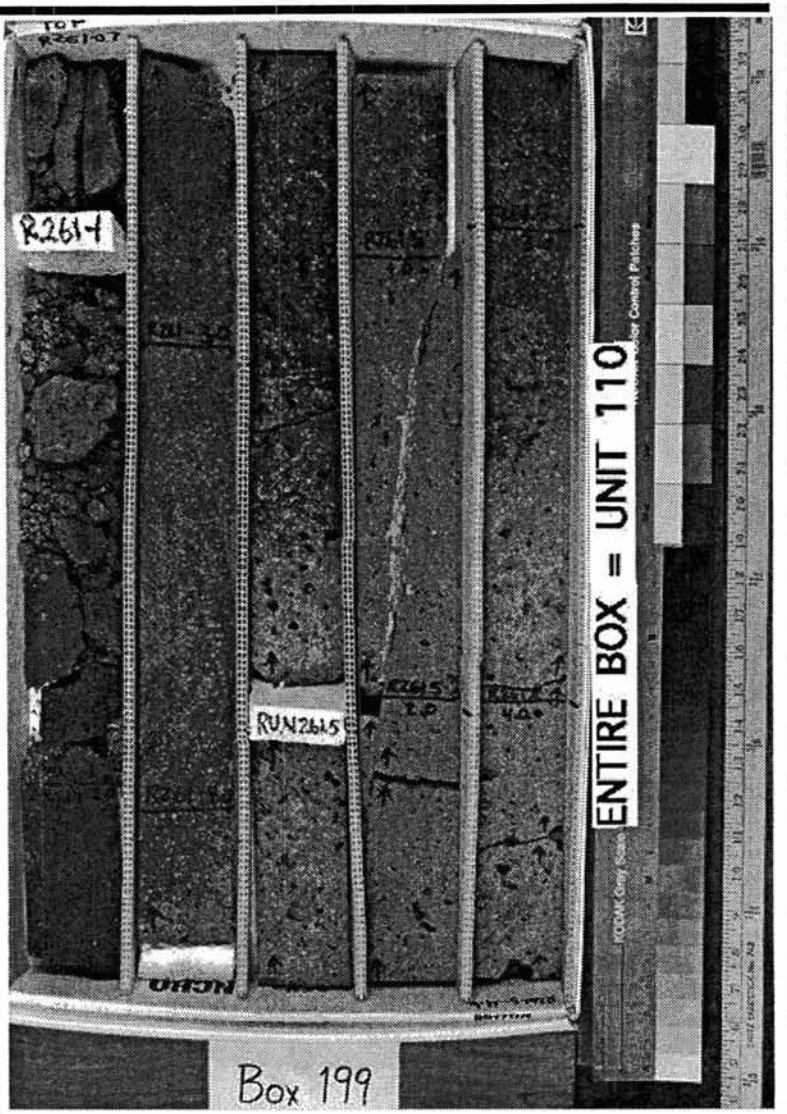
Box #:	Cores in box
199	261

Loggers:	NB
Date logged:	11/24/94
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1793.0
Driller's depth:bottom [feet]:	1802.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: moderately to highly olivine phyric basalt **UNIT #:110**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa/transitional
unconsolidated clasts from R261-0.7 to R261-2.0
Phenocrysts/Clasts:
moderately to highly phyric (~10%) –
olivine – 9-11% – 3-5 mm – equant – iddingsite
very slightly altered olivine; red and blue coloration; no obvious spinel inclusions
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 7-10% – 1-5 mm – sub-angular – equant and horizontally elongated–
size increasing from R261-2.4 to R261-4.3
Alteration: slightly (2-10% altered) –
clasts highly weathered (70-80%); groundmass slightly altered from R261-4.3 to the lower part of the flow.
Veins: none
Fractures: one large fracture extending from R261.5-1.0 to R261.5-2.4, filled by yellowish clay
Additional comments:



Box #: 200

Cores in box
261
262

Loggers: NB
Date logged: 11/24/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1802.6
Driller's depth:bottom [feet]: 1811.8
Core type: HQ

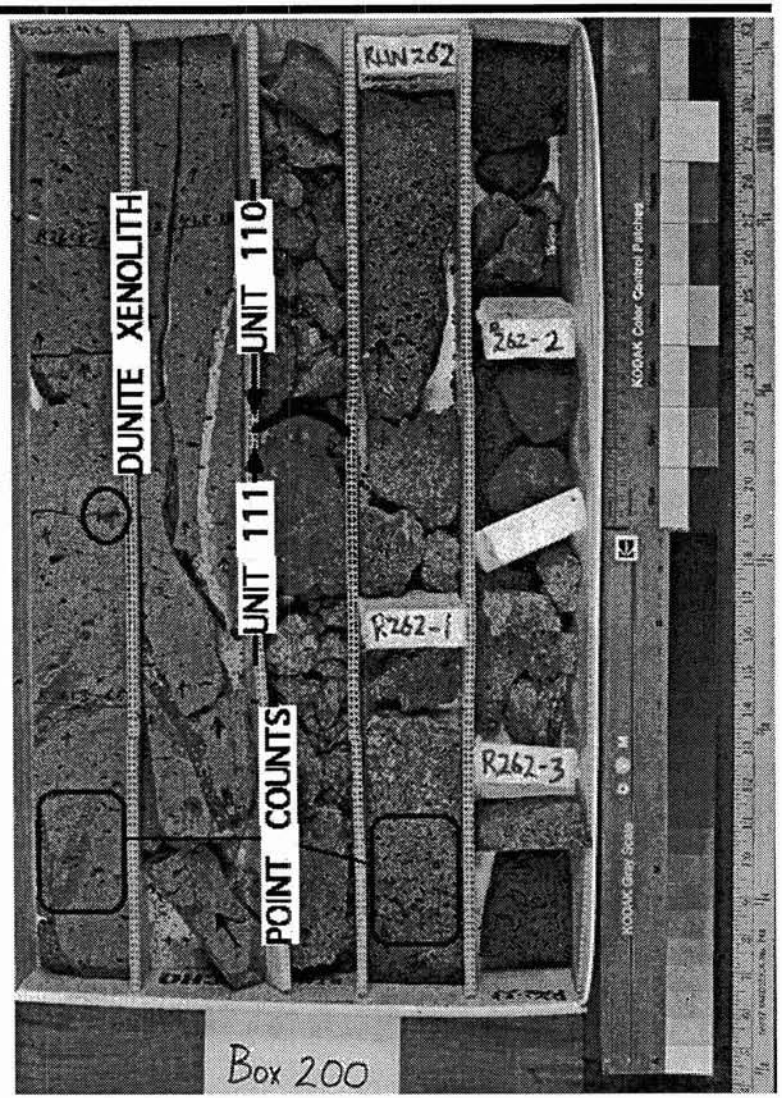
Units in box: 2

BOX UNIT 1: moderately to highly olivine phyric basalt — UNIT #: 110

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R261.5-9.3-1806.0')(flow contact)
Unit type: aa/transitional
See box 199
Phenocrysts/Clasts:
moderately to highly phyric (~10%) –
olivine – 10-12% – 1-5 mm – equant – iddingsite
very slightly altered olivines; very rare spinel inclusions
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-7% – 5-10 mm – sub-rounded – equant-elongated –
vesicles horizontally elongated near the bottom contact (from R261.5-6.0 to the bottom contact)
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: three fractures filled by yellowish clay
Additional comments:
one piece of dunite about 20 mm in diameter (see photo)

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 111

Contacts: Top (ft): (R 261.5-9.3-1806.0')(Flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa/transitional
unconsolidated clasts on top and between R261-2.0 and R261-2.3
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-7% – 3-5 mm – equant – iddingsite
no spinel inclusions visible; highly altered olivine crystals; very angular and brecciated minerals
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-25% – >5 mm – sub-rounded – equant –
yellowish clay
Vesicles are often connected.
Alteration: moderately (10-40% altered) –
Clasts on top are 100% altered.
Veins: none
Fractures: none
Additional comments:
Vesicle size decreases from the contact toward the flow interior. The boundary between finely and coarsely vesiculated layers is sharp.



Box #: 201

Cores in box: 262, 263

Loggers: NB
Date logged: 11/24/93
Checked by: MG
Check date: 12/12/93

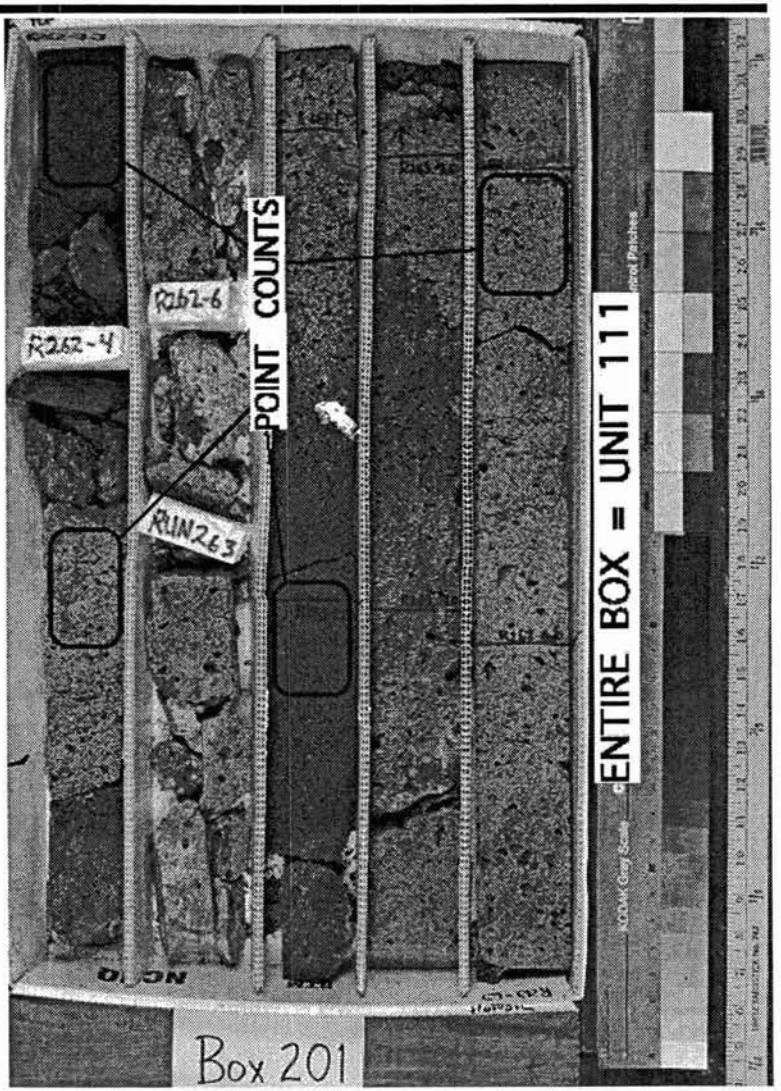
Driller's depth:top [feet]: 1811.8
Driller's depth:bottom [feet]: 1821.5
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:111

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa/transitional
clasts at R262-4.0
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 12-15% – 3-5 mm – equant – iddingsite
Some big (>10 mm) olivine crystals. Red and blue alteration.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-25% – 2-3 mm – sub-rounded – equant–
Vesicles size progressively decreases toward the bottom contact.
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: weakly
Additional comments:



Box #:	Cores in box
202	263 264 265

Loggers: MBB
Date logged: 11/24/93
Checked by: MG
Check date: 12/12/93

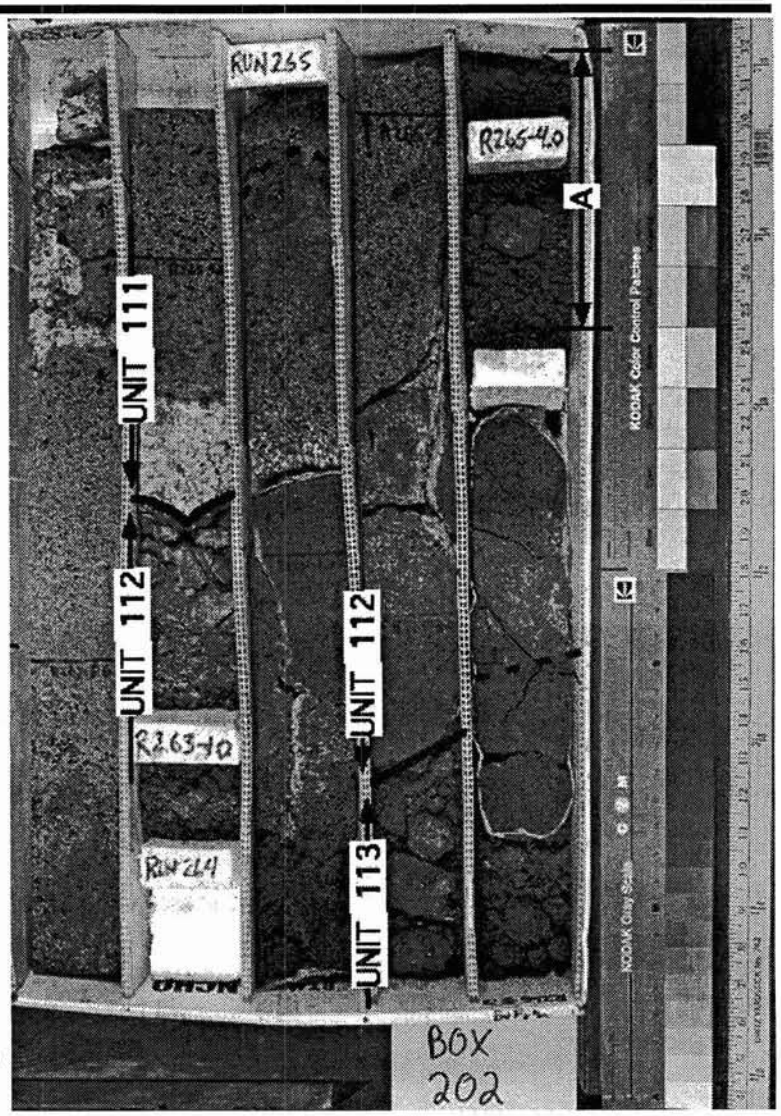
Driller's depth:top [feet]: 1821.5
Driller's depth:bottom [feet]: 1831.5
Core type: HQ
Units in box: 3

BOX UNIT 1: highly olivine phyric basalt **UNIT #: 111**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R263-9.6-1824.6')(flow contact)
Flow contact defined by an increase in vesicularity and a decrease in vesicle size down section toward contact; below contact material is weathered, oxidized and rubbly. There is a bright red baked zone right at contact.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 16% – 2-4 mm – equant –
16% at R263-8.9; no obvious spinel inclusions in the olivine phenocrysts; olivines are moderately oxidized and iddingsitized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – rounded to subrounded – equant –
Right above the contact, vesicles are filled with clays.
Alteration: slightly (2-10% altered) –
groundmass oxidation
Veins: none
Fractures: weakly fractured: 5/2.6 ft; ivory-colored material (clays?) coating fracture surfaces
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 112**

Contacts: Top (ft): (R 263-9.6-1824.6')(flow contact)
Bottom (ft): (R265-3.3-1828.5')(flow contact)
For a description of upper contact, see unit 1; bottom contact defined by increasing vesicularity down toward contact and a zone of rubbly friable material below the contact (this zone is not strongly baked).
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~14% – 2-3 mm – equant –
14% at R265-2.3; no obvious spinel inclusions in the olivines; olivines are moderately oxidized and iddingsitized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 15-25% – 1-5 mm – subrounded – equant to elongate –
basalt surfaces within the vesicles have a reddish, oxidized color; elongate vesicles show evidence of flow alignment
Alteration: moderately (10-40% altered) –
groundmass oxidation
Veins: none
Fractures: Weakly to moderately fractured; see photo for location of rubble zones. Ivory-colored material (clay?) coating most of the fractured surfaces.
Additional comments:
internal contact at R265-0.2



BOX 202 CONTINUED ON NEXT PAGE

Box #:	Cores in box
202	263 264 265

Loggers:	MBB
Date logged:	11/24/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1821.5
Driller's depth:bottom [feet]:	1831.5
Core type:	HQ
Units in box:	3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 113

Contacts: Top (ft): (R 265-3.3-1828.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
top contact described in unit 2; internal contact at R265-5.0 contact defined by increase in vesicularity/decrease in vesicle size above the contact, and by a weathered/oxidized friable baked zone (~10 cm thick) that grades into rubbly material below the contact.

Unit type: pahoehoe

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 2-4 mm – equant –
Mode based on visual estimate; all of the olivines are highly oxidized.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N3 dark gray (freshest material) – **Structures:** – **Sorting:** –

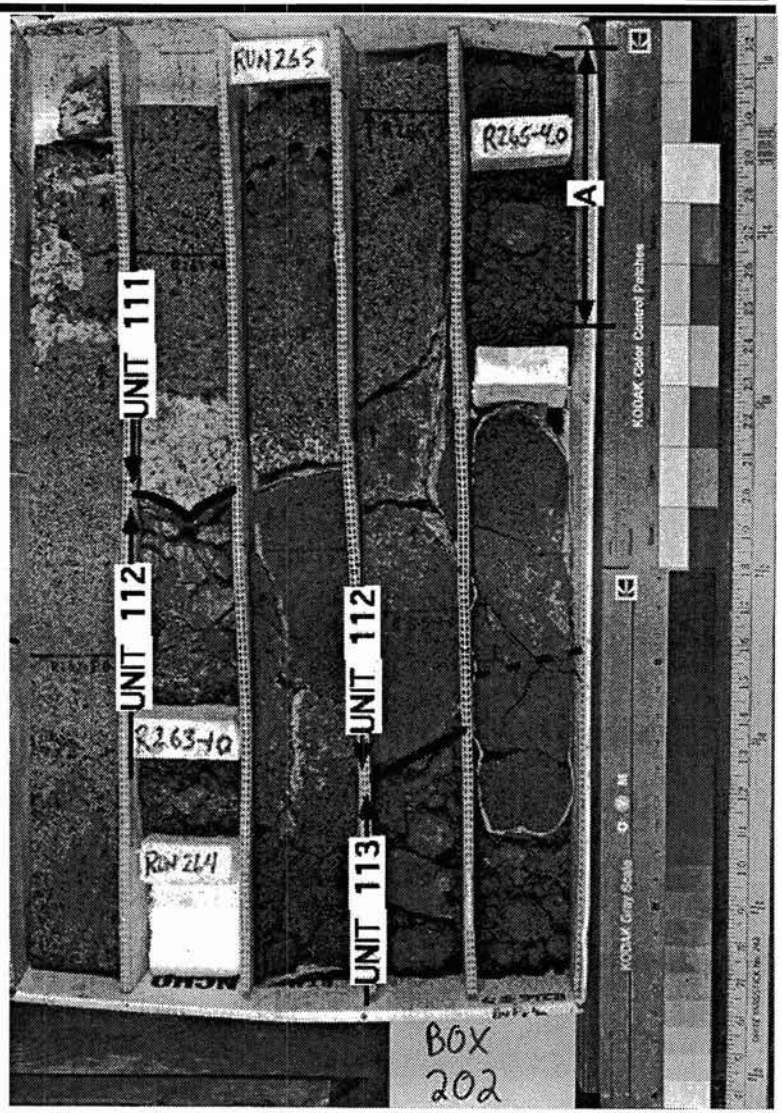
Vesicles: 20-30% – 1-3 mm – sub-rounded – equant to elongate –

Alteration: moderately to very highly (10-95% altered) –
groundmass alteration

Veins: none

Fractures: rubble - see photo; yellowish-cream clay-like coating

Additional comments:
see photo: "A" = highly weathered friable zone below upper contact



Box #: 203

Cores in box
265
266

Loggers: NB
Date logged: 11/24/93
Checked by: MG
Check date: 12/12/93

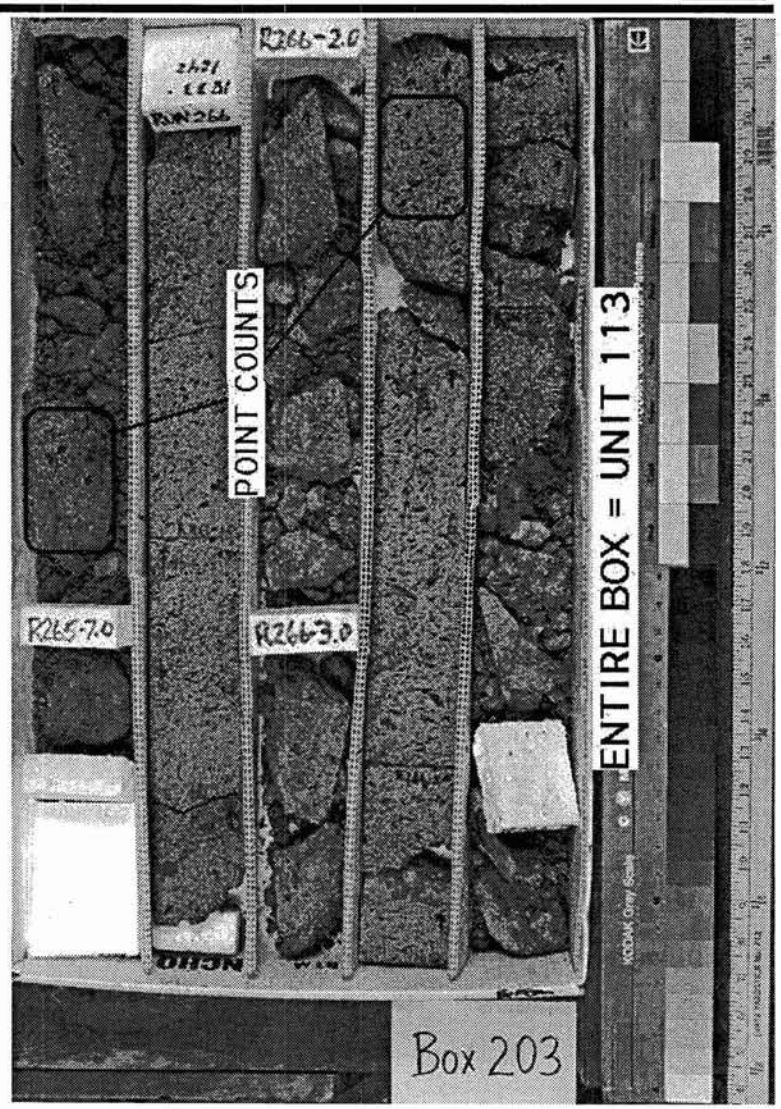
Driller's depth:top [feet]: 1831.5
Driller's depth:bottom [feet]: 1842.0
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately to highly olivine phyric basalt

UNIT #:113

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
n.b.-unit described as pahoehoe in previous box
Phenocrysts/Clasts:
moderately to highly phyric (~10%) –
olivine – 8-12% – 3-5 mm – equant-laths – iddingsite
Olivine crystals highly altered. Some big (>10 mm) xenocrysts.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 3/4 dark reddish brown – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-angular – elongated –
Alteration: slightly to very highly (2-95% altered) –
Veins: none
Fractures: weakly to rubbly
Additional comments:
highly altered rocks from the bottom an aa flow; NaCl ppt



Box #: 204

Cores in box
267
268

Loggers: NB
Date logged: 11/24/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1842.0
Driller's depth:bottom [feet]: 1853.2
Core type: HQ

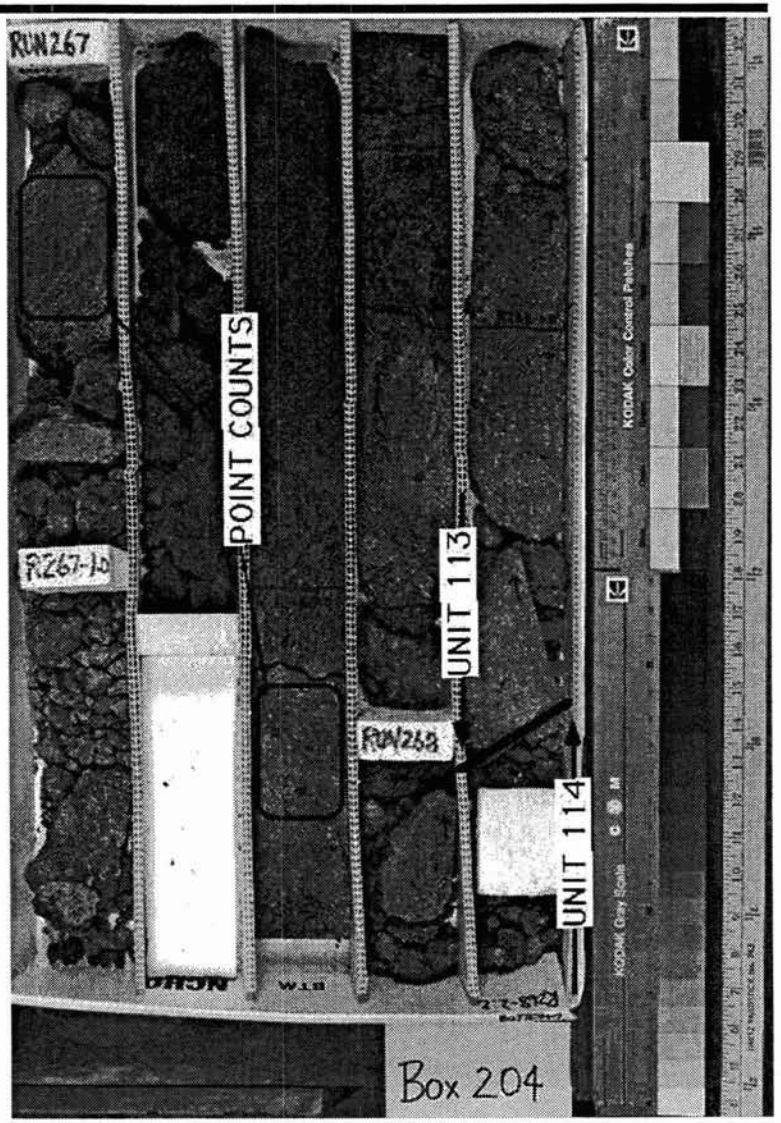
Units in box: 2

BOX UNIT 1: moderately to highly olivine phyric basalt — UNIT #: 113

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R268-1.9-1851.9')(flow contact)
Unit type: aa
clasts on the bottom
Phenocrysts/Clasts:
moderately to highly phyric (~10%) –
olivine – 8-12% – 3-5 mm – equant – iddingsite
Some olivines look fresh. No spinel inclusions visible.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 7-10% – 3-5 mm – sub-angular – equant –
Regular distribution of vesicles in the flow.
Alteration: highly (40-80% altered) –
Veins: none
Fractures: none
Additional comments:
internal contacts at 267-0.7, 2.1

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 114

Contacts: Top (ft): (R 268-1.9-1851.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red baked rubble zone
Unit type: aa
plastic deformation features
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 3-7 mm – equant – iddingsite
Crystals seem relatively fresh with a light green coloration.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 4/2 grayish red – **Structures:** – **Sorting:** –
Vesicles: 10-15% – 1-5 mm – sub-rounded – elongated –
Vesicles are holes created during plastic deformation of molten rock.
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: none
Additional comments:
Typical aa-type of flow. Some big olivine xenocrysts (>15 mm).



Box #:	Cores in box
205	268 269 270

Loggers:	MBB
Date logged:	11/24/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1853.2
Driller's depth:bottom [feet]:	1866.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 114

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R270-2.1-1859.6')(flow contact)
flow contact defined by a lithology change from more to less olivine phyric basalt; no weathered zone observed, some clinkery material at the bottom of the upper unit

Unit type: massive
aa(?) core consists of non-vesicular massive material

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~14% – 3-5 mm – equant to tabular –
14% at R268-3.8; 14% at R270-0.9; no obvious spinel inclusions in the olivines; rare olivine phenocrysts >5 mm in longest dimension. Olivines are moderately oxidized down to R269-0.5.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

Vesicles: 5-10% – 2-5 mm – sub-rounded – elongate –

Alteration: slightly to highly (2-80% altered) –
Groundmass is oxidized to a pinkish color in the interval R268-2.2 to R270-0.0; from R270-0.0 to bottom contact, core is only slightly oxidized.

Veins: none

Fractures: moderately fractured; no substantial clay development on the fractured surfaces

Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 115

Contacts: Top (ft): (R 270-2.1-1859.6')(flow contact)
Bottom (ft): (R270-6.0-1863.5')(flow contact)
see unit 1 for a description of the top contact; bottom contact (at bottom of box) defined by a decrease in vesicle size in the upper unit and the remnant of a clay(?) rich zone.

Unit type: pahoehoe
interpretation based on the high vesicle content and the rounded vesicle shape

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant –
minor oxidation in the fresher portion of the core; more highly oxidized in the regions where the groundmass is more strongly oxidized
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

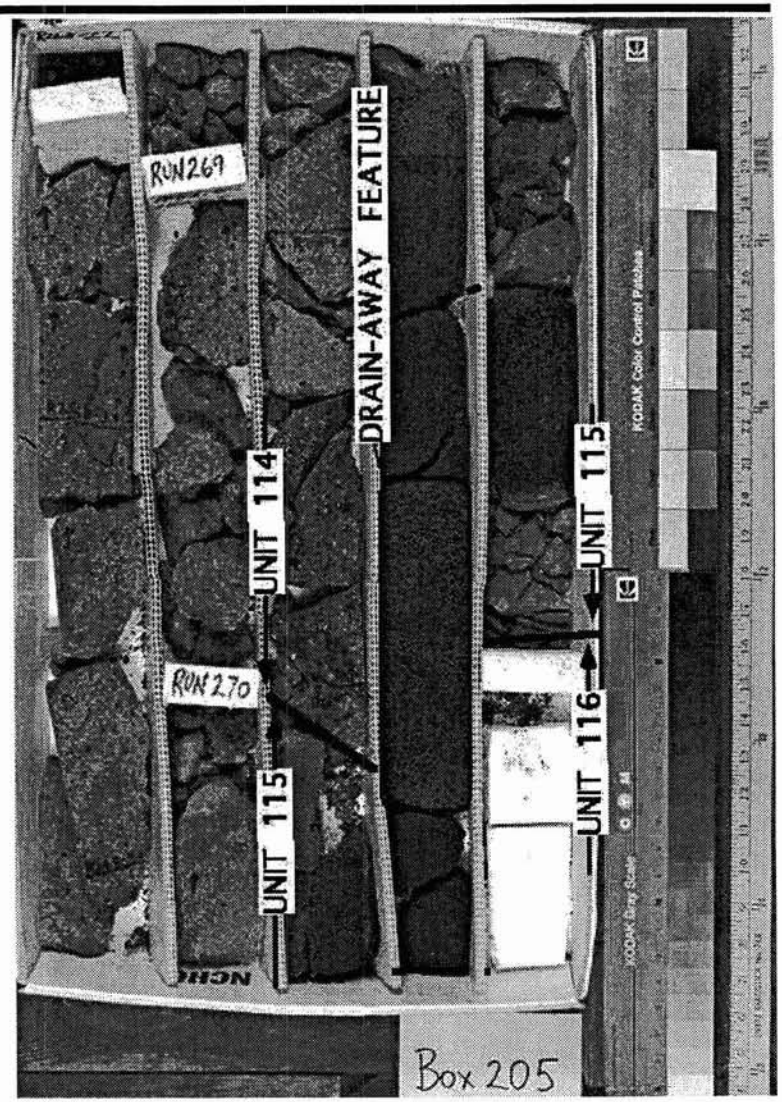
Vesicles: 20-50% – <1 to 3 mm – rounded – equant to elongate –

Alteration: slightly to moderately (2-40% altered) –
groundmass oxidation

Veins: none

Fractures: weakly fractured zones grading sharply into rubbly zones (see photo)

Additional comments:
internal flow contacts at R270-3.3, 4.8; contact is at base of box



Box #: **206**

Cores in box	
271	274
272	
273	

Loggers: NB
Date logged: 11/24/93
Checked by: MG
Check date: 12/12/93

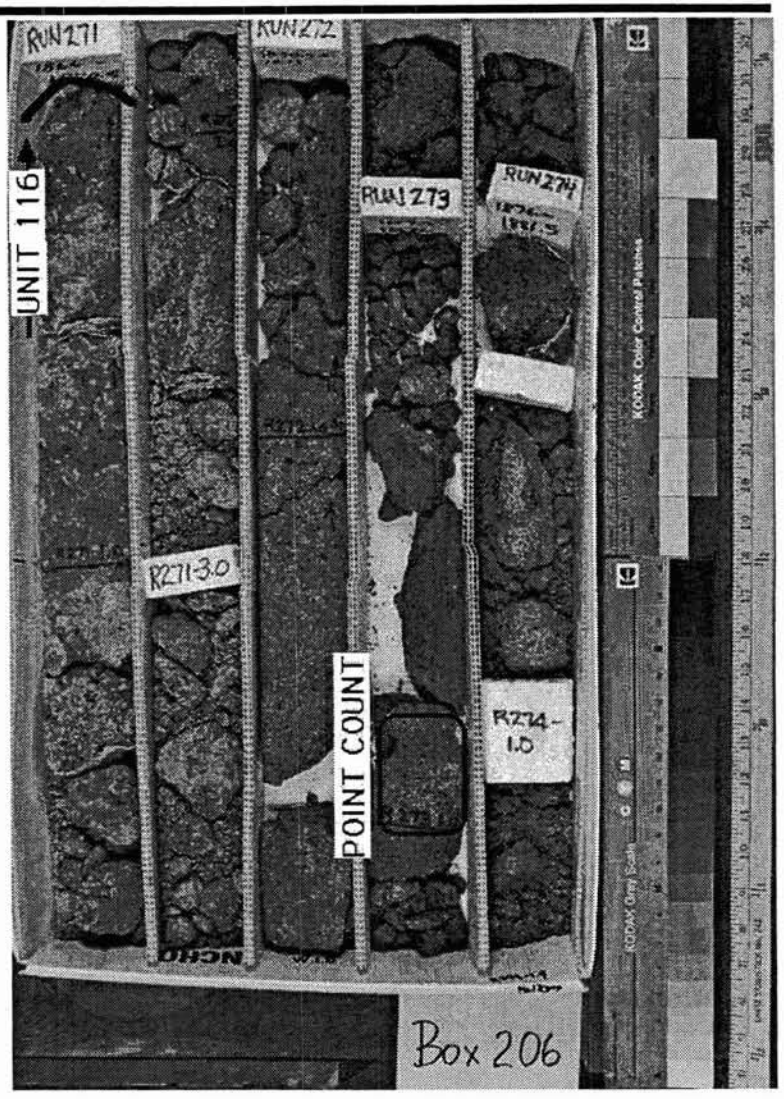
Driller's depth:top [feet]: 1866.0
Driller's depth:bottom [feet]: 1877.8
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:116

Contacts: Top (ft): (R 270-6.0-1863.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
very altered rocks
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-5 mm – equant – iddingsite
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 3/4 dusky gray – **Structures:** – **Sorting:** –
Vesicles: 7-10% – 1-3 mm – sub-rounded – equant –
Alteration: moderately to highly (10-80% altered) –
Veins: none
Fractures: moderately to highly
Additional comments:
Numerous scattered pieces of rock having a very similar aspect. No correlation between the different pieces.



Box #:	Cores in box
207	274 275

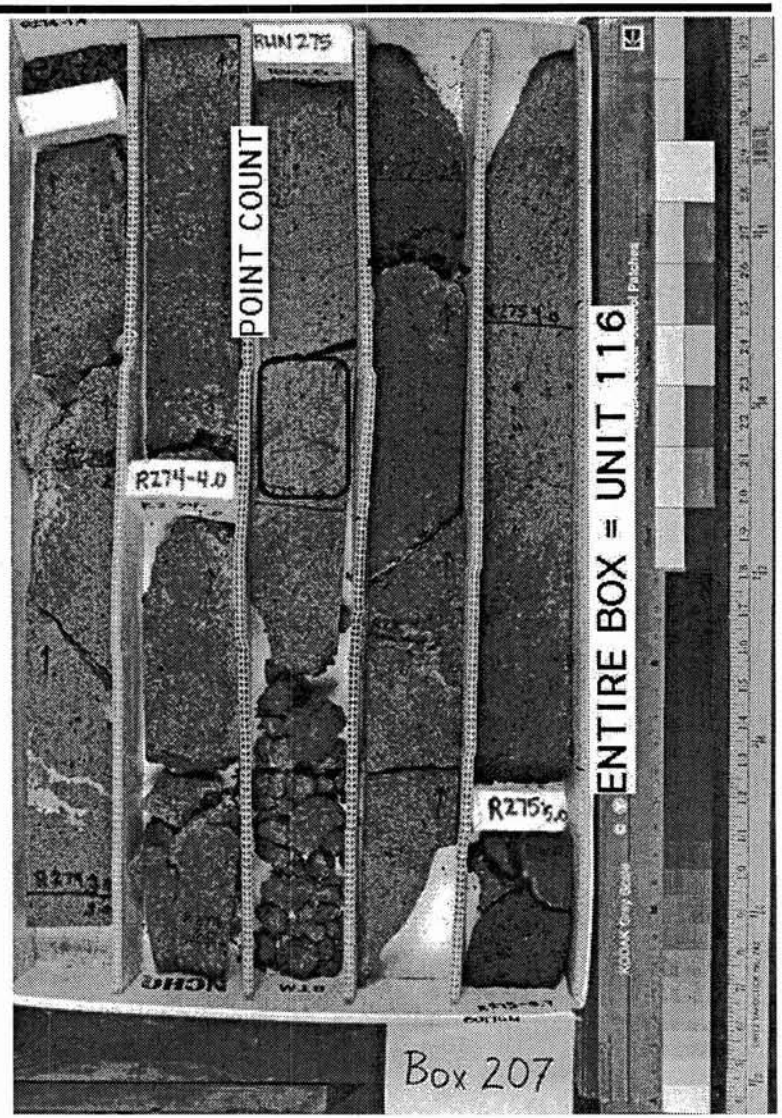
Loggers:	NB
Date logged:	11/25/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1877.8
Driller's depth:bottom [feet]:	1887.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:116

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
plastic deformation features
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 2-5 mm – equant – iddingsite
Olivine crystals highly altered. Some big xenoliths (>10 mm). 100 pts counted at R275-4.0.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 red dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-15% – 1-5 mm – sub-angular – elongated–
Great variations in vesicle content. Aa-type of flow with a massive core and highly vesicular borders.
Alteration: highly (40-80% altered) –
highly oxidized; some yellowish clay
Veins: none
Fractures: one fracture filled by yellowish clay at R274-2.8
Additional comments:
NaCl deposits; internal contacts at R275-1.5, 2.2



Box #:	Cores in box	
208	275	278
	276	279
	277	280

Loggers: NB
Date logged: 11/25/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1887.7
Driller's depth:bottom [feet]: 1905.6
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:116

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
highly brecciated aa-type of flow

Unit type: aa
internal part of an aa flow, with cavities

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 4-7 mm – equant – iddingsite
high concentration (reach 30% in volume) of olivine crystals in clasts filling the cavities
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: 10R 4/2 grayish red – **Structures:** – **Sorting:** –

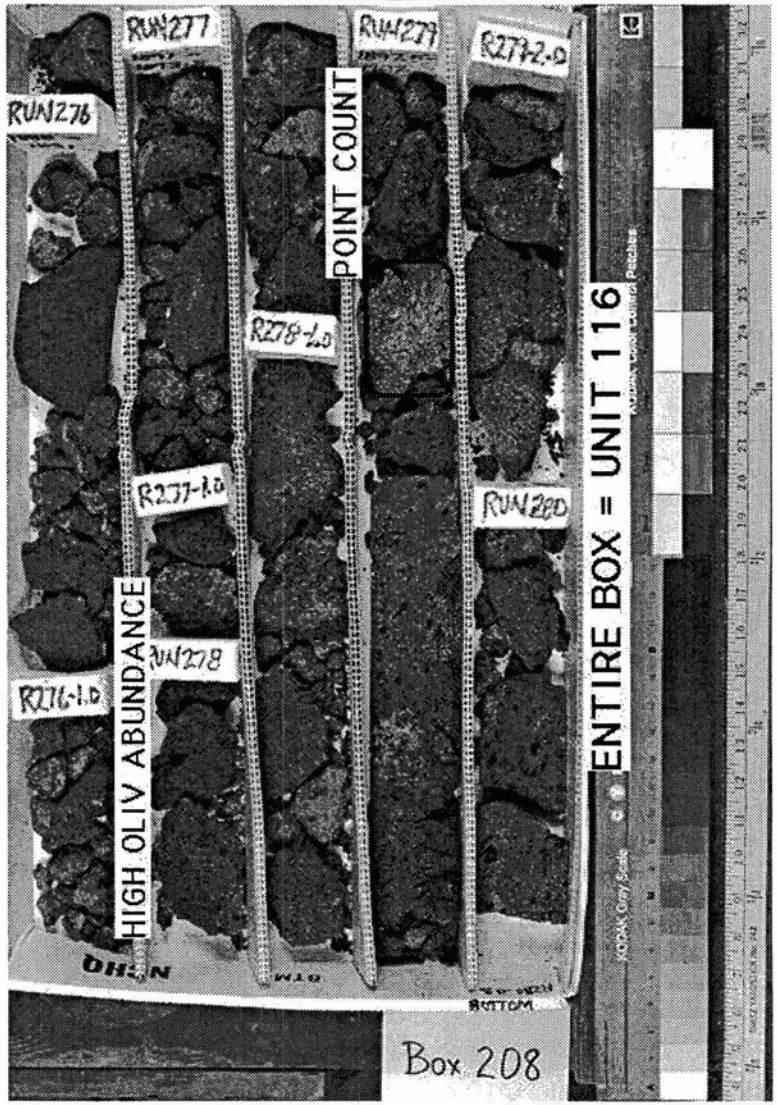
Vesicles: 10-20% – 1-3 mm and 7-10 mm – sub-angular – elongated –
important variation of vesicles content in the flow

Alteration: highly (40-80% altered) –
Red oxidation of the entire unit. No clay visible.

Veins: none

Fractures: none

Additional comments:
NaCl deposits. Concentration of rock fragments and olivine crystals filling the flow cavities.



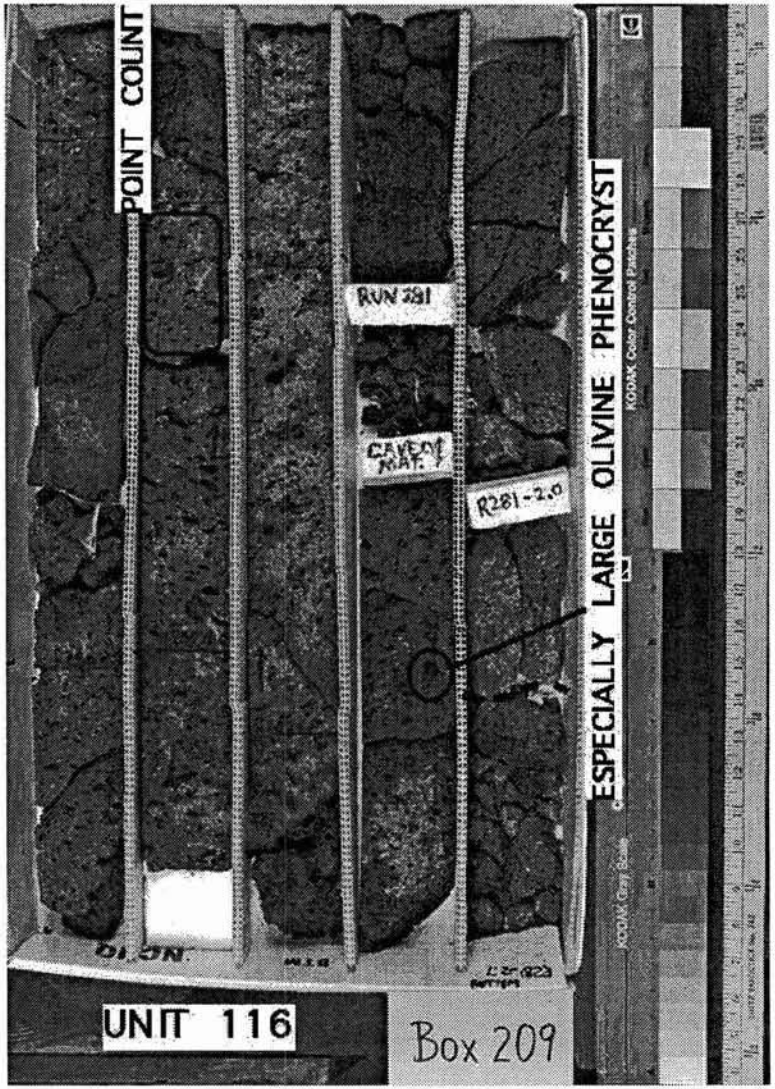
Box #:	Cores in box
209	280 281

Loggers:	NB
Date logged:	11/25/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1905.6
Driller's depth:bottom [feet]:	1916.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:116**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
No contact. Internal part of aa-type of flow with cavities.
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 3-5 mm – equant – iddingsite
Highly altered olivine crystals. Some big anhedral xenoliths (see photo). 100 pts counted at R280-5.0.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 4/2 grayish red – **Structures:** – **Sorting:** –
Vesicles: 10-15% – 5-15 mm – sub-angular – elongated–
Great variations in vesicles size.
Alteration: moderately to highly (10-80% altered) –
Red oxidation. Some yellowish clay coated on the clasts surfaces.
Veins: none
Fractures: moderately
Additional comments:
NaCl deposits; internal contacts at R280-6.3, R281-2.4; gabbroic inclusion at R281-1.2, R280-4.2



Box #:	Cores in box
210	281 282 283

Loggers:	NB
Date logged:	11/25/93
Checked by:	MG
Check date:	12/12/93

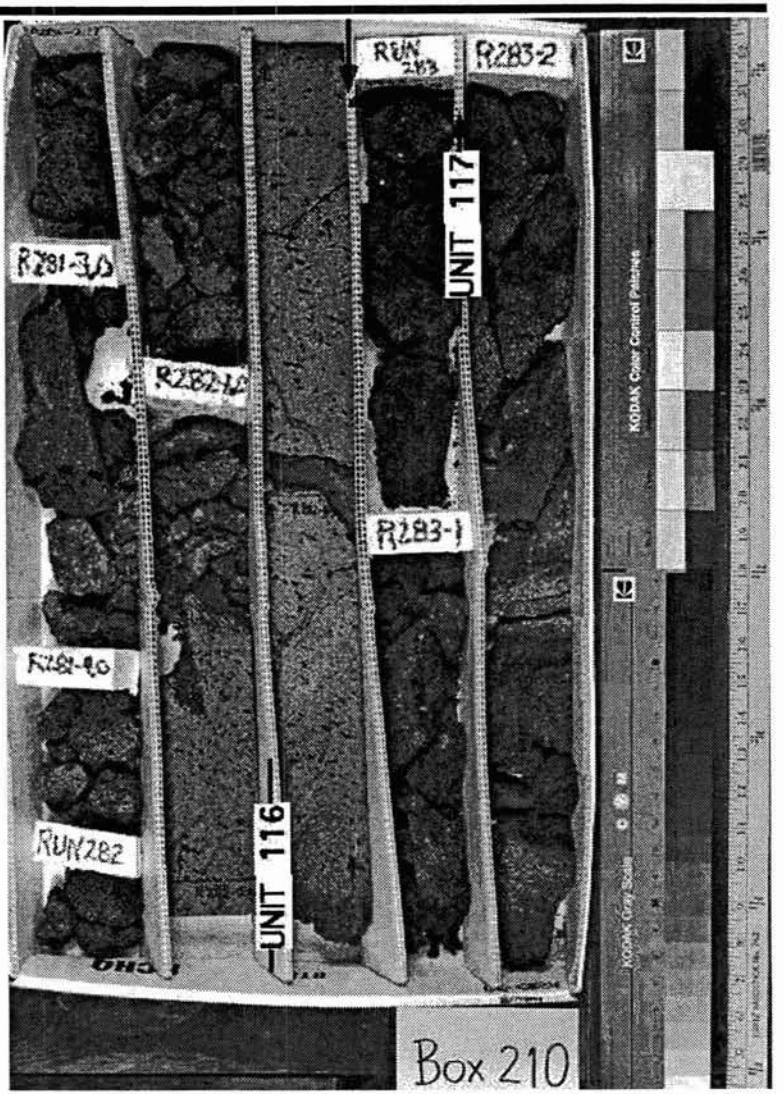
Driller's depth:top [feet]:	1916.6
Driller's depth:bottom [feet]:	1926.7
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 116

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R283-0.0-1922.0')(flow contact)
Unit type: aa
internal flow contact R281-3.4; underlying flow has plagioclase
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 3-5 mm – equant – iddingsite
Olivine crystals horizontally elongated
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 4/2 grayish red – **Structures:** – **Sorting:** –
Vesicles: 7-10% – 3-5 mm – sub-angular – horizontally elongated –
Variations in size and volume of vesicles
Alteration: moderately (10-40% altered) –
Oxidation of the clastic material. Inner part of the flow relatively fresh.
Veins: none
Fractures: none
Additional comments:
NaCl coating. Plastic deformation features. Olivine and vesicles are both horizontally elongated in the most massive part of the flow, between R262-1.5 and R263. Rare gabbroic inclusions.

BOX UNIT 2: moderately plagioclase-olivine phyric basalt — UNIT #: 117

Contacts: Top (ft): (R283-0.0-1922.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-8% – 1-3 mm – equant to blocky –
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: dusky red – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – sub-angular – equant –
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: rubbly
Additional comments:
rare gabbroic clots



Box #:	Cores in box	
211	283	286
	284	
	285	

Loggers:	NB
Date logged:	11/25/93
Checked by:	MG
Check date:	12/12/93

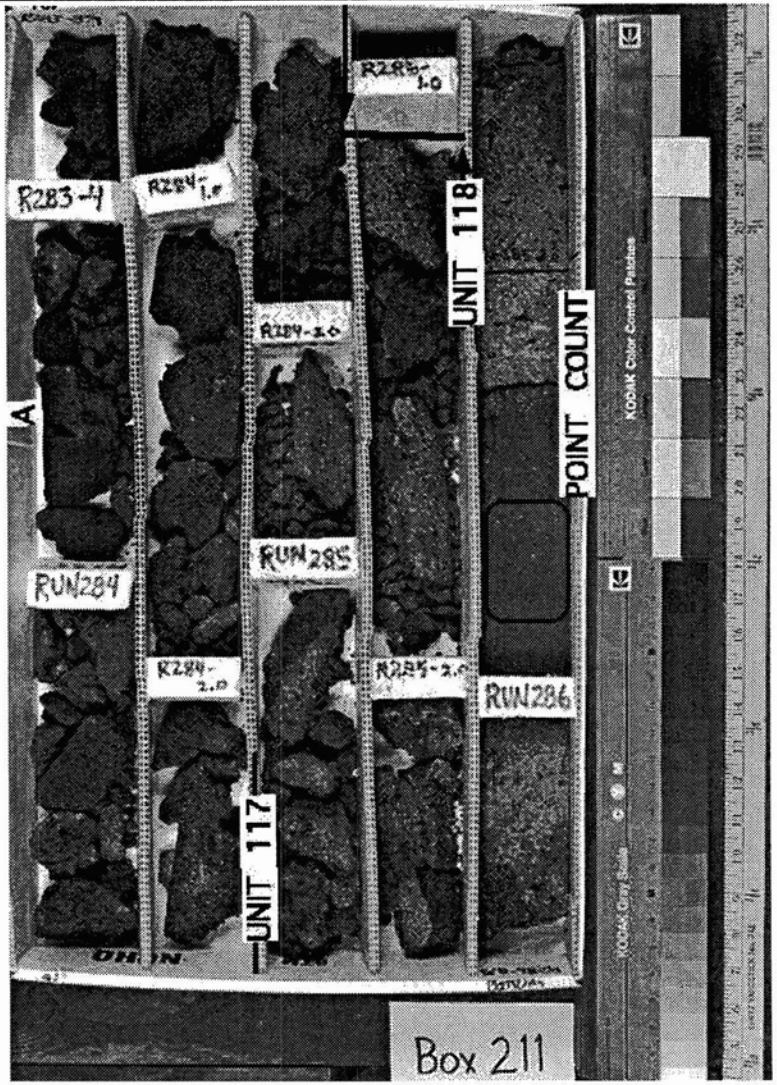
Driller's depth:top [feet]:	1926.7
Driller's depth:bottom [feet]:	1938.0
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #: 117**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R285-1.0-1932.1')(flow contact)
approximate location; rubble zone
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-7% – 3-5 mm – equant – iddingsite
Olivine crystals relatively fresh in the massive part of the flow. Blue/red alteration color.
plagioclase – <<1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-15% – 1-5 mm – sub-rounded – equant –
some big sub-angular vesicles
Alteration: moderately (10-40% altered) –
high red oxidation of most of the vesicular clasts
Veins: none
Fractures: none
Additional comments:
"A"= reddish block at R284-4.5 finely vesiculated; rare, small (3 mm) open-textured gabbros; NaCl deposits on the massive part of the flow.

BOX UNIT 2: moderately olivine phyric basalt **UNIT #: 118**

Contacts: Top (ft): (R285-1.0-1932.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-10% – 1-3 mm – equant to blocky –
100 pts counted at R285-3.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-2 mm – sub-rounded – equant –
Alteration: fresh to slightly (<2-10% altered) –
Veins: none
Fractures: weakly to rubble
Additional comments:
NaCl ppt



Box #:	Cores in box
212	286 287

Loggers:	NB
Date logged:	11/25/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1938.0
Driller's depth:bottom [feet]:	1949.2
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt

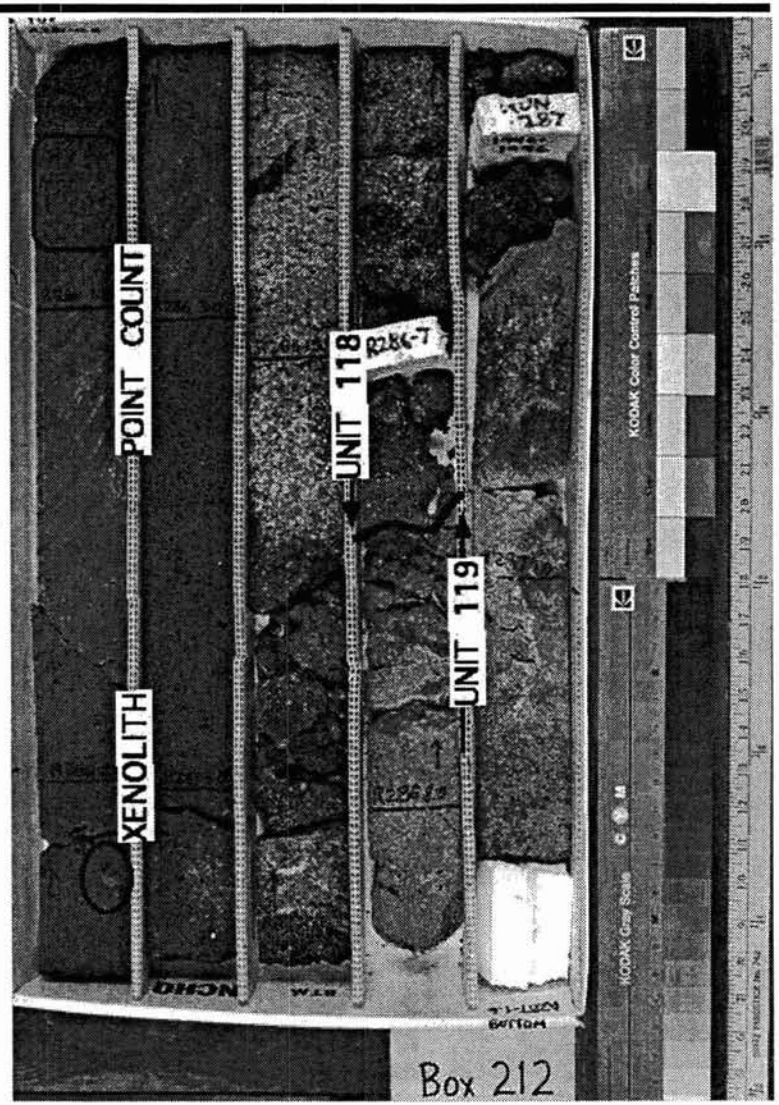
UNIT #: 118

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 286 - 7.4 - 1942.4')(flow contact)
Contact made up of highly altered lava fragments.
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 12-15% – 3-7 mm – equant – iddingsite
Olivine crystals seems fresher than in the upper part of the unit.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-15% – 1-5 mm – sub-angular – equant –
Some vesicles are horizontally elongated.
Alteration: moderately (10-40% altered) –
red oxidation of the clastic material
Veins: none
Fractures: none
Additional comments:
One big olivine xenolith (dunite?)(see photo). Pieces of basalt embedded in the massive part of the flow. Rare plagioclase microphenocrysts.

BOX UNIT 2: aphyric basalt

UNIT #: 119

Contacts: Top (ft): (R 286 - 7.4 - 1942.4')(flow contact)
Bottom (ft): (R --')(continuous with next box)
highly weathered contact
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-3 mm – equant – clay, iddingsite
very rare olivine crystals
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-15% – 1-3 mm – sub-rounded – equant –
clay
vesicles are filled by yellowish clay from R286-7.5 to R287-1.4
Alteration: highly (40-80% altered) –
oxidation of clasts and yellowish clay in vesicles
Veins: none
Fractures: weakly: 1/2 ft
Additional comments:
NaCl deposits.
Very low content of olivine.



Box #:	Cores in box
213	287 288

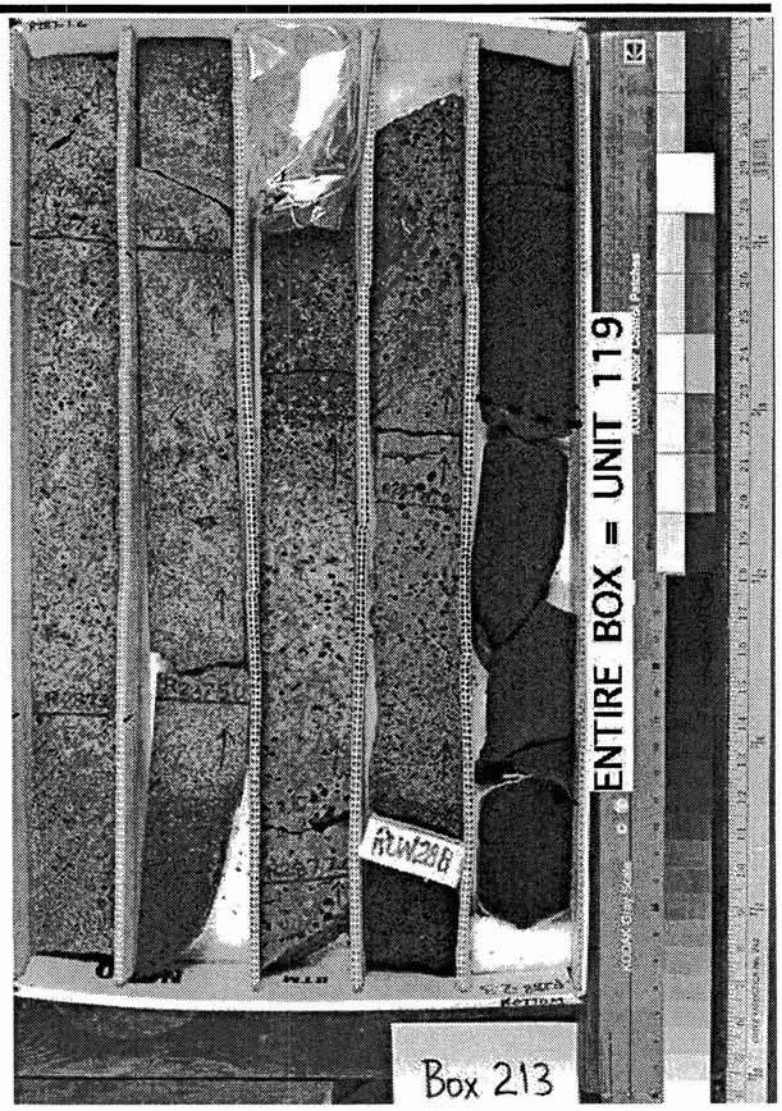
Loggers:	NB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1949.2
Driller's depth:bottom [feet]:	1958.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:119

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
no contact
Unit type: aa/transitional
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 3-5 mm – equant – iddingsite, clay
Very rare olivine crystals. One big crystal at R287-7.1 (see photo).
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 15-30% – 3-7 mm – sub-rounded – equant–
clay
great variations in vesicle shape and volume
Alteration: moderately (10-40% altered) –
Finely vesicular zones are more altered than the massive inner part of the flow.
Veins: none
Fractures: none
Additional comments:
internal flow contact at R288-1.0



Box #: 214

Cores in box
288
289

Loggers: MBB
Date logged: 11/26/93
Checked by: MG
Check date: 12/12/93

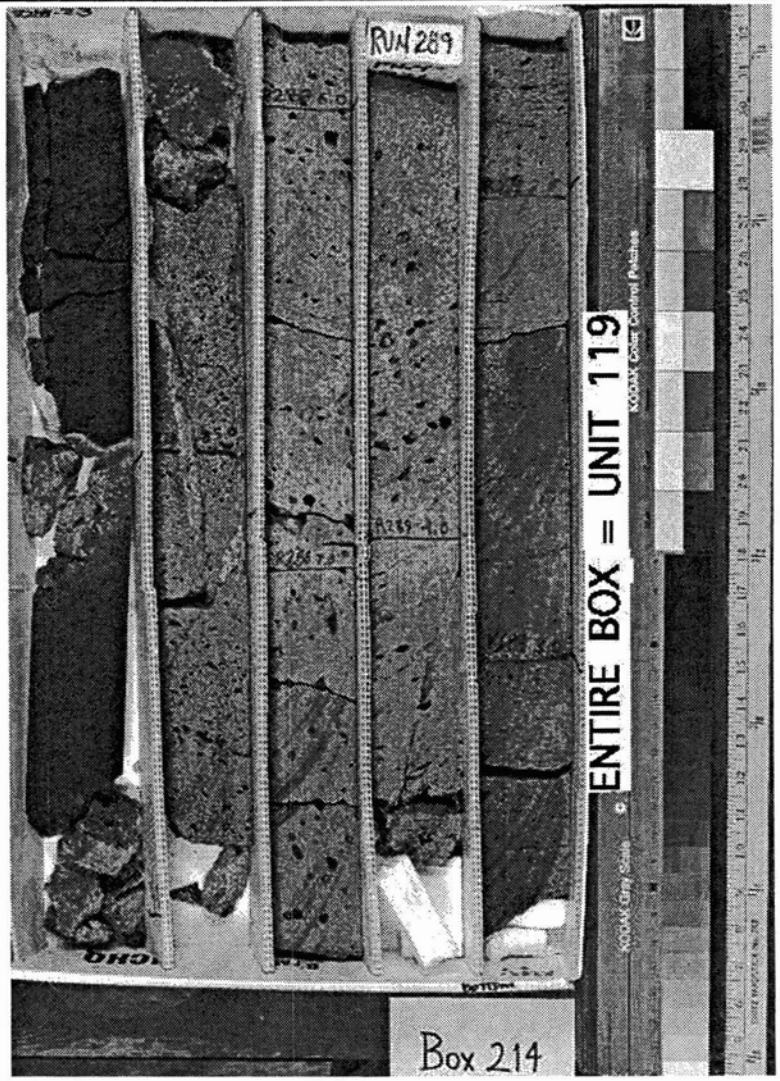
Driller's depth:top [feet]: 1958.5
Driller's depth:bottom [feet]: 1967.8
Core type: HQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:119

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant –
no obvious spinel inclusions in the olivines; minor oxidation and iddingsite development
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 3-20% – 1-5 mm – rounded to subrounded – equant to elongate –
Vol.% decreases as size increases down section; elongate subhorizontal vesicle trains are present below R288-6.0; below R288-5.0, <<1 mm sized angular voids are present in the groundmass; above R288-3.5, basalt surfaces within the vesicles are oxidized.
Alteration: fresh to slightly (<2-10% altered) –
Core appears fresh below R288-5.0; slight groundmass oxidation above that depth.
Veins: none
Fractures: Weakly fractured below R288-5.0; between R288-2.3 and R288-5.0 core is moderately fractured to rubbly. Ivory colored material (clays?) coat many of the fracture surfaces
Additional comments:
NaCl ppt



Box #:	Cores in box
215	289 290

Loggers:	NB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

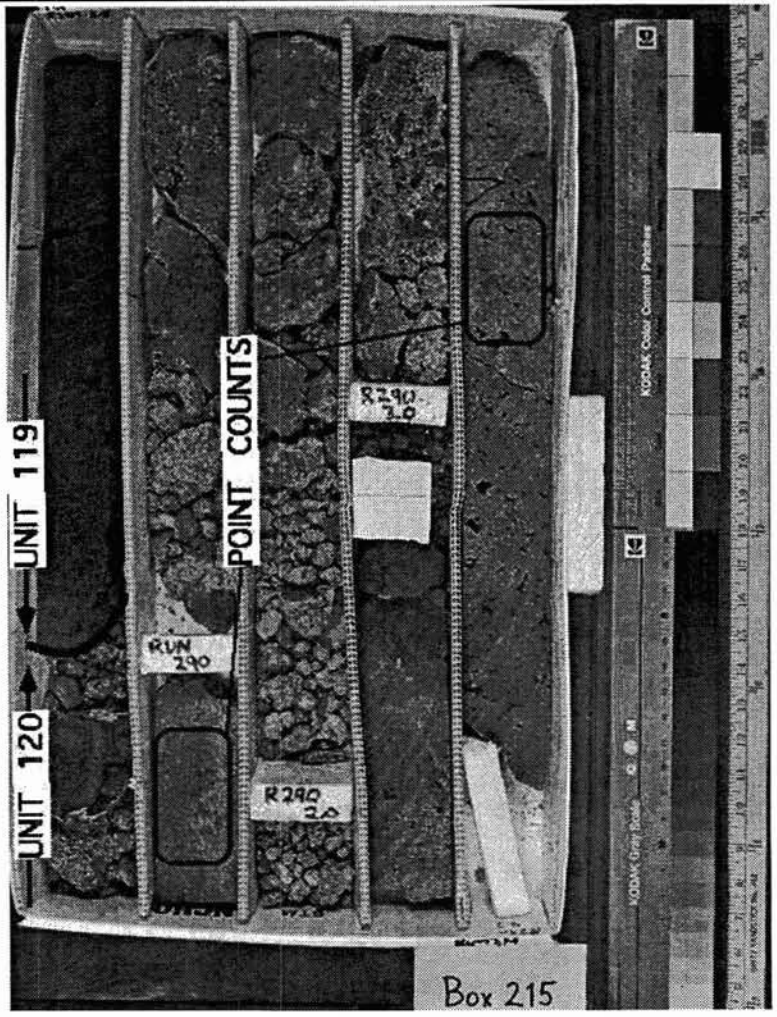
Driller's depth:top [feet]:	1967.8
Driller's depth:bottom [feet]:	1976.8
Core type:	HQ
Units in box:	2

BOX UNIT 1: aphyric basalt **UNIT #: 119**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R289-4.8-1967.3')(flow contact)
Unit type: aa/transitional
base of a flow
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 3-5 mm – equant – iddingsite
very rare olivine crystals
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – elongated –
% increases towards base to 10-20%
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: weakly: 1/1.6 ft
Additional comments:

BOX UNIT 2: moderately olivine phyric basalt **UNIT #: 120**

Contacts: Top (ft): (R289-4.8-1967.3')(Flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 4-6% – 2-5 mm – equant – iddingsite, clay
100 pts counted at R290-5.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 2-5% – 1-3 mm – sub-rounded – elongated –
clay
vesicles with a very irregular shape
Alteration: highly (40-80% altered) –
Yellowish clay embedding angular fragments of basalt.
Veins: none
Fractures: none
Additional comments:
Very thin flow or highly weathered top of a big flow.



Box #: 216

Cores in box
290
291

Loggers: NB
Date logged: 11/26/93
Checked by: MG
Check date: 12/12/93

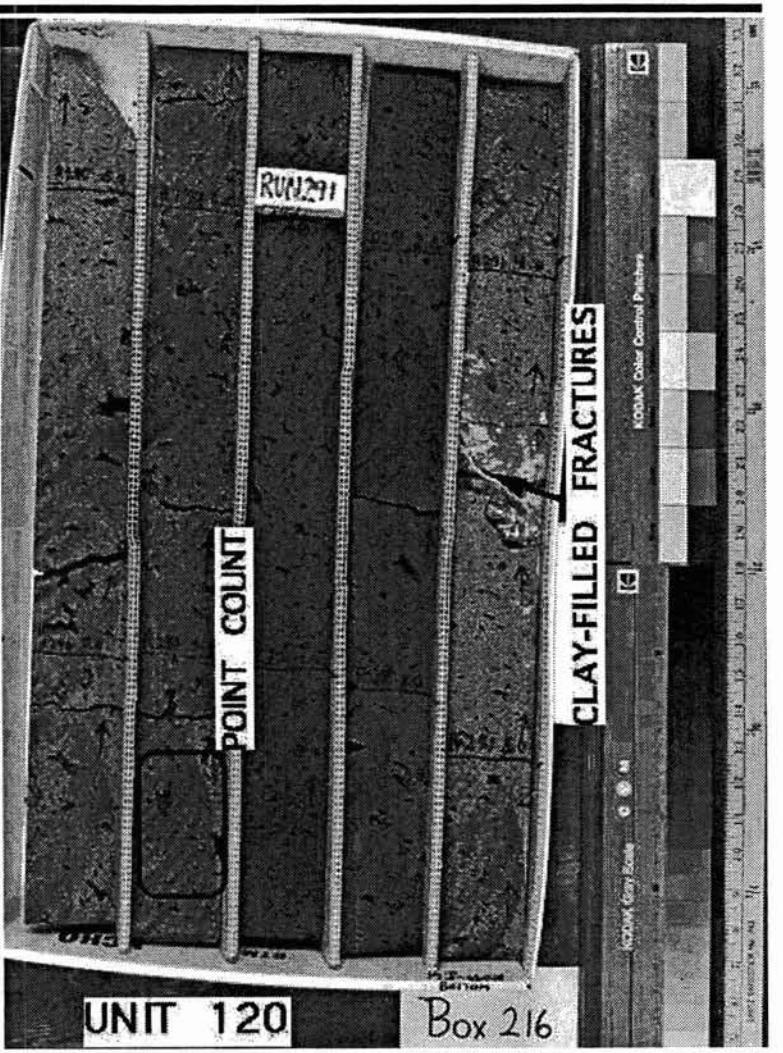
Driller's depth:top [feet]: 1976.8
Driller's depth:bottom [feet]: 1986.1
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:120

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
inner part of a thick lava flow
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 3-5% – 2-5 mm – equant – iddingsite
200 pts counted at R291-3.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: 7-10% – 5-10 mm – angular – inclined–
big vesicles sometimes connected
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: Weakly: 8/10 ft; one fracture filled by yellowish clay (see photo).
Additional comments:
NaCl deposits from R290-6.0 to R290-8.2.



Box #:	Cores in box
217	291 292

Loggers:	MBB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1986.1
Driller's depth:bottom [feet]:	1997.0
Core type:	HQ
Units in box:	3

BOX UNIT 1: moderately olivine phyric basalt **UNIT #: 120**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R292-1.6-1992.8')(flow contact)
flow contact defined by lithologic change (from more to less olivine phyric) and flow textures on the piece labeled "E" on the photo

Unit type: massive to rubbly
massive between R291-5.4 and R291-10.3; rubble in R292 (see photo)

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – ~7% – 2-4 mm – equant to tabular –
7% at R292-6.1; rare spinel inclusions in the olivine phenocrysts; olivines present in crystal clots
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

Vesicles: 1-10% – <1-5 mm – subrounded to subangular – equant to sub- horizontally elongate –
Vesicles are inhomogeneously distributed; smaller vesicles are equant.

Alteration: fresh to slightly (<2-10% altered) –
slight groundmass oxidation within 2 ft of the contact

Veins: none

Fractures: weakly fractured: 6/4.8 ft; ivory-colored material coating some of the fractured surfaces

Additional comments:
extremely rare plagioclase - usually associated with olivine in crystal clots
see photo: "A" = piece with dunite inclusion on the exterior surface; "B" = vesicular microgabbro; "C" = autolith; "D" = vesicular microgabbro (?)

BOX UNIT 2: moderately olivine phyric basalt **UNIT #: 121**

Contacts: Top (ft): (R 292-1.6-1992.8')(flow contact)
Bottom (ft): (R292-3.0-1994.2')(flow contact)
see unit 1 for a description of the upper contact; lower contact defined by remnant of a weathered zone, which does not have a strongly baked appearance, a thin patch of vesicular "glassy" material, and a lithologic change from less to more highly phyric basalt

Unit type: rubble
with exception of a 1' section (see photo), the unit consists of rubbly/clinkery material

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 1-2 mm – equant –
olivines are slightly oxidized
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 to 5YR 4/1 – **Structures:** – **Sorting:** –

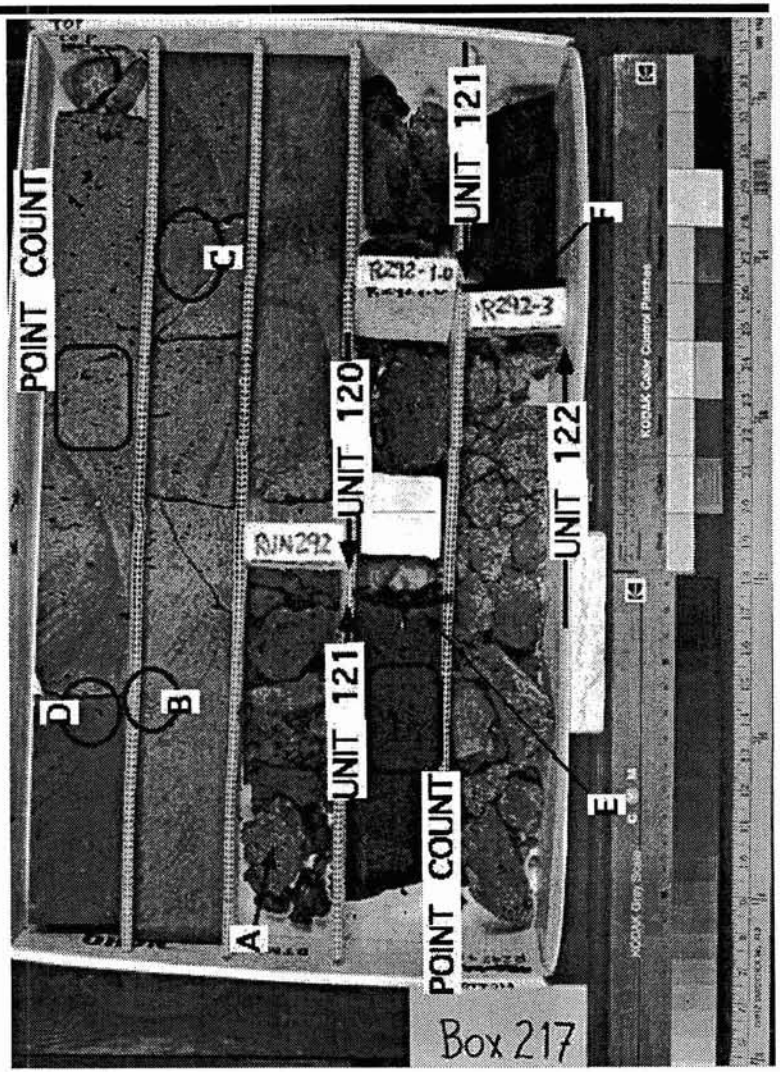
Vesicles: 10-30% – 1-3 mm – rounded to subrounded – equant –
some larger subangular vesicles

Alteration: moderately (10-40% altered) –
groundmass oxidation

Veins: none

Fractures: rubbly (see photo)

Additional comments:
see photo: "F" = small patch of glassy/cryptocrystalline material on the lower surface



BOX 217 CONTINUED ON NEXT PAGE

Box #:	Cores in box
217	291 292

Loggers:	MBB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1986.1
Driller's depth:bottom [feet]:	1997.0
Core type:	HQ
Units in box:	3

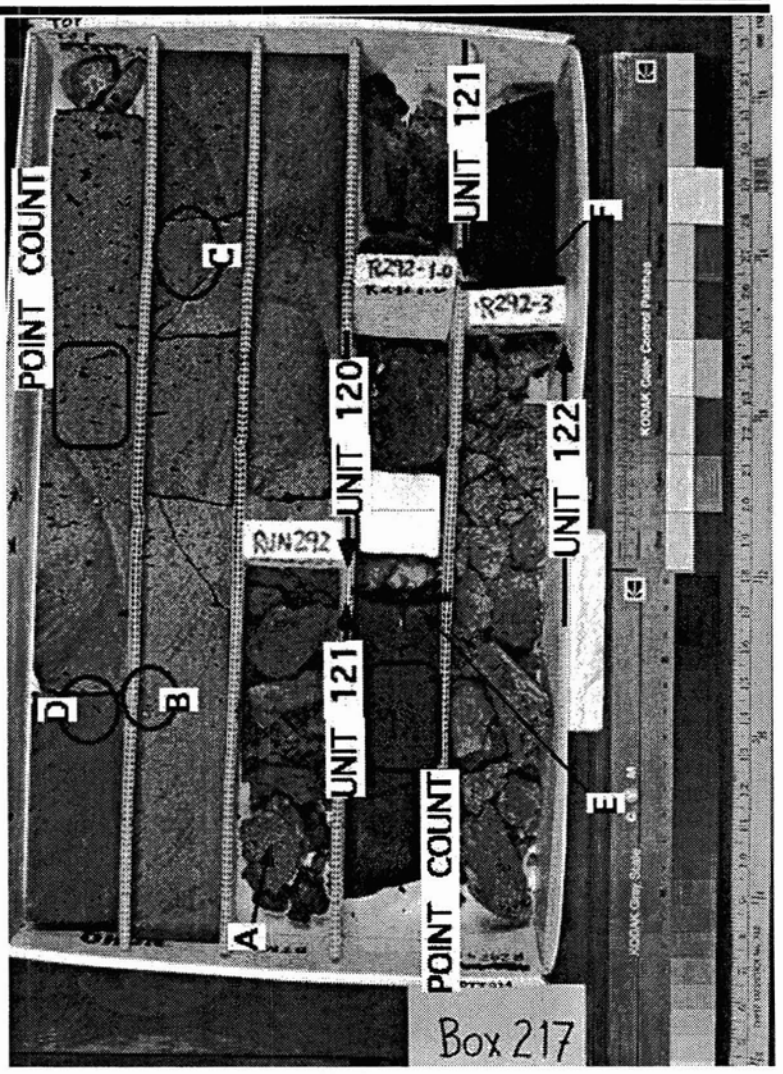
BOX UNIT 3: highly olivine phyric basalt **UNIT #: 122**

Contacts: Top (ft): (R 292-3.0-1994.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 2 for a contact description.

Unit type: rubble
Clinkery material with minor baked zone; most of the pieces are <5 cm in longest dimension.

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2-3 mm – equant –
visual estimate of mode
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N3 to 10R 4/1 – **Structures:** – **Sorting:** –
Vesicles: 5-30% – <1-3 mm – sub-rounded – equant –
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: rubble
Additional comments:
Some of the pieces have "glassy" selvages. This unit appears to be a mix of material.



Box #:	Cores in box
218	293 294

Loggers:	MBB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	1997.0
Driller's depth:bottom [feet]:	2006.5
Core type:	HQ
Units in box:	3

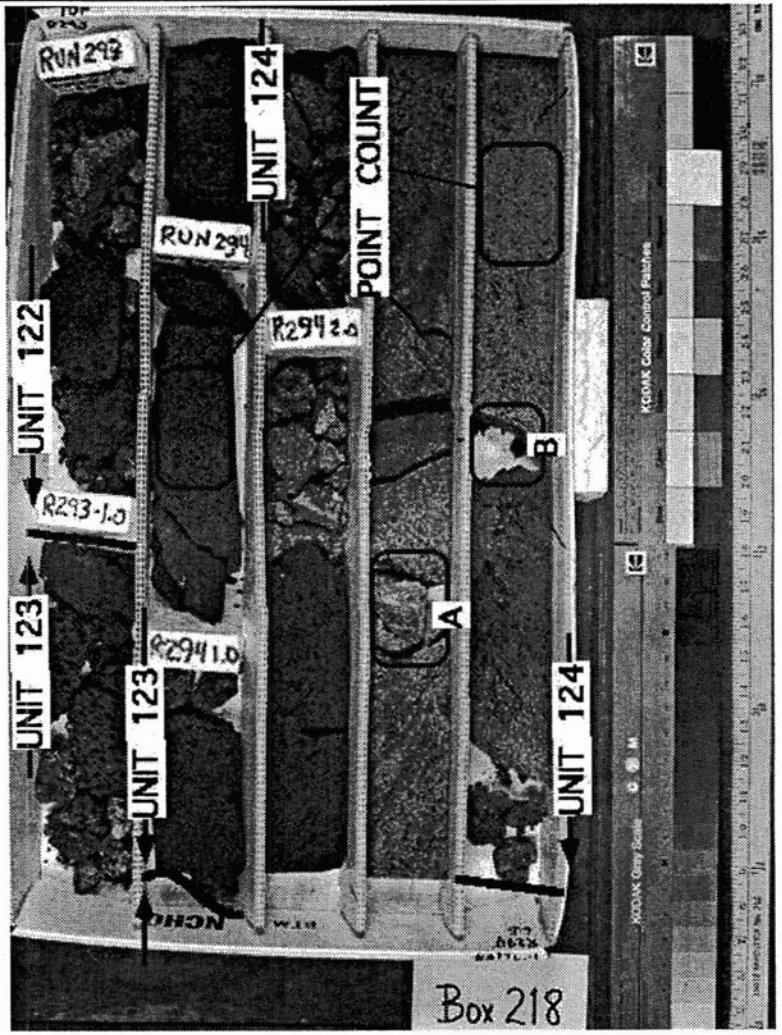
BOX UNIT 1: highly olivine phyric basalt **UNIT #: 122**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R293-1.0-1998.0')(flow contact)
flow contact defined by flow textures and clinkery material above the contact and highly vesicular (<1 mm-sized vesicles) zone below contact
Unit type: rubble
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-3 mm – equant –
visual estimate of mode
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 3/4 dusky red – **Structures:** – **Sorting:** –
Vesicles: 5-30% – <1-3 mm – sub-rounded – equant–
Alteration: slightly to moderately (2-40% altered) –
Veins: none
Fractures: rubble
Additional comments:

BOX UNIT 2: moderately olivine phyric basalt **UNIT #: 123**

Contacts: Top (ft): (R 293-1.0-1998.0')(flow contact)
Bottom (ft): (R294-1.5-2000.8')(flow contact)
See unit 1 for upper contact description; lower contact defined by zone of increasing vesicularity and decreasing vesicle size above the contact.
Unit type: pahoehoe
classification based on vesicularity
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 7% – 2-5 mm – equant to tabular –
7% at R294-0.5; no obvious spinels; moderately oxidized; MnO coatings
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 4/2– **Structures:** – **Sorting:** –
Vesicles: 20-30% – <1-10 mm – rounded to subrounded – equant to elongate (random orientation)–
Alteration: moderately (10-40% altered) –
groundmass oxidation; ivory-colored material (clay?) coating the basalt within some of the vesicles
Veins: none
Fractures: moderately fractured -- see photo for location of rubbly zones
Additional comments:

BOX 218 CONTINUED ON NEXT PAGE



Box #: 218

Cores in box: 293, 294

Loggers: MBB
Date logged: 11/26/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 1997.0
Driller's depth:bottom [feet]: 2006.5
Core type: HQ

Units in box: 3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 124

Contacts: Top (ft): (R 294-1.5-2000.8')(flow contact)
Bottom (ft): (R294-6.5-2005.8')(flow contact)
see unit 2 for top contact description

Unit type: aa/transitional
classification based on the presence of clinkery material which grades into massive core with highly sheared/elongate vesicles

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 11% – 2-3 mm – equant –
11% at R294-5.4; rare spinel inclusions in the olivine phenocrysts; olivines occur in crystal clots; some phenocrysts are >5 mm in longest dimension; olivines are moderately to slightly oxidized, freshest below R294-5.0
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray– **Structures:** – **Sorting:** –

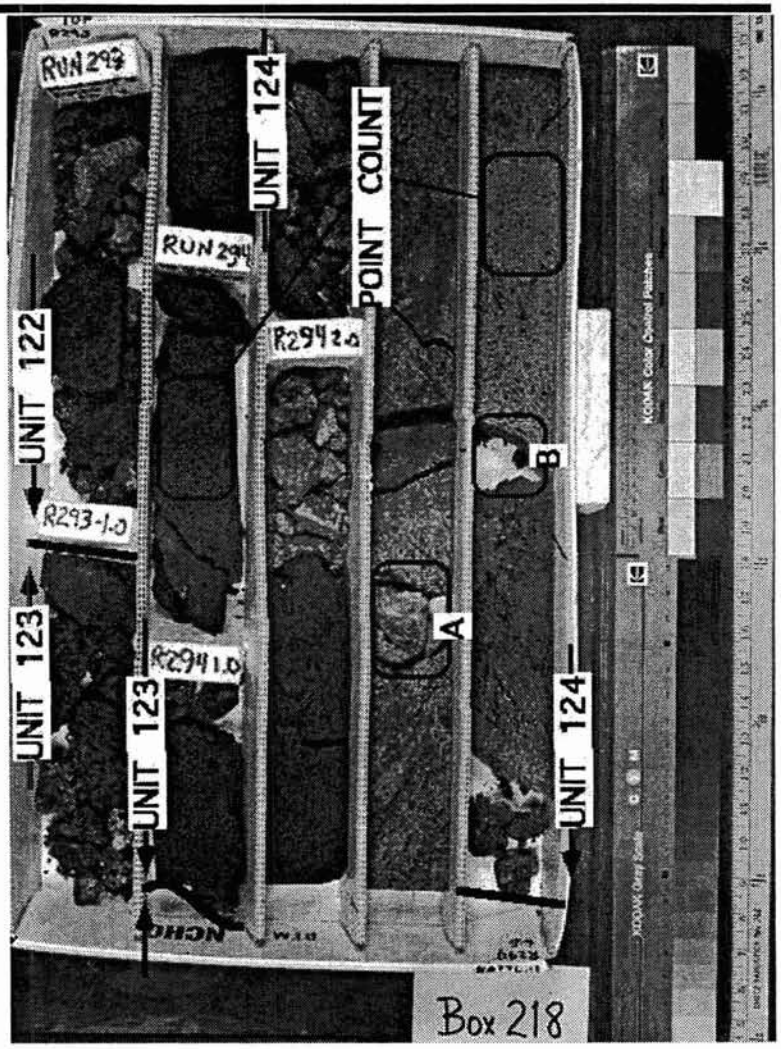
Vesicles: 5-10% – <1-5 mm – subrounded to angular – equant to elongate–
smallest vesicles are equant; extent of vesicle shearing increases away from the contact; below R294-5.0 vesicles are highly sheared and give an indication of a circular flow pattern

Alteration: fresh to moderately (<2-40% altered) –
extent of groundmass oxidation decreases down section away from from the contact; fresh core below R294-3.0

Veins: none

Fractures: weakly fractured: 6/4.2 ft, measured below R294-2.3, doesn't include rubbly zone labeled "A" on photo

Additional comments:
see photo: "B" = vug?
minor NaCl ppt



Box #:	Cores in box	
219	294	297
	295	
	296	

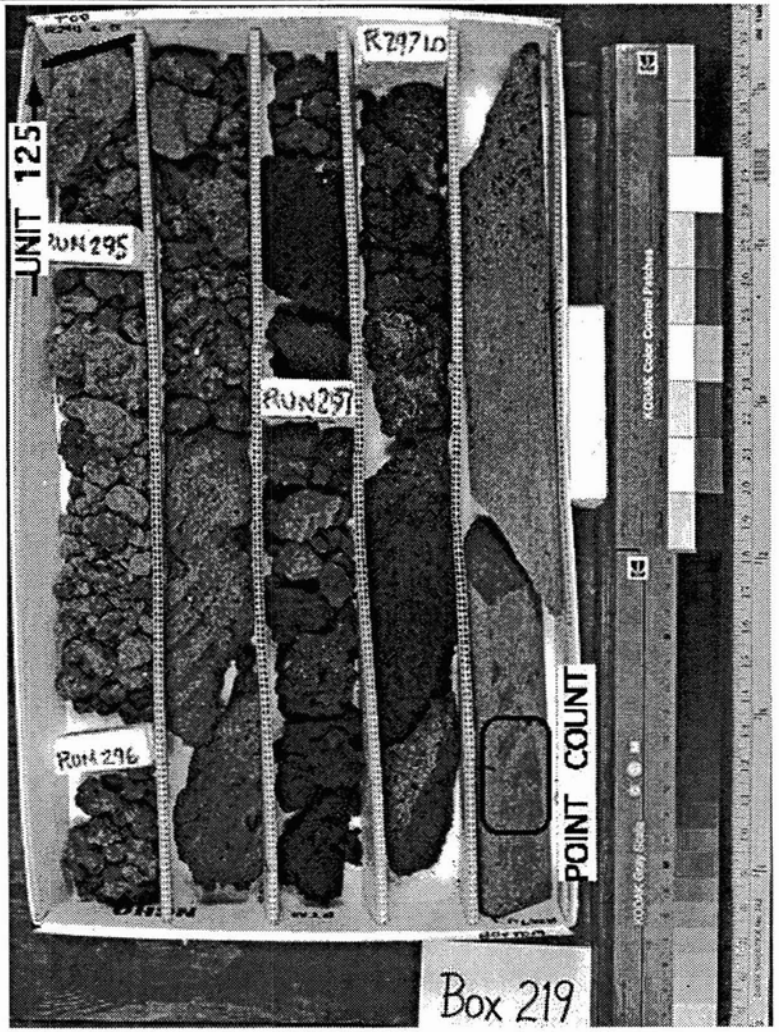
Loggers:	NB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	2006.5
Driller's depth:bottom [feet]:	2017.8
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:125

Contacts: Top (ft): (R 294-6.5-2005.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
approximately at top of box
Unit type: aa
clastic and massive part of aa-type of flow
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 12-15% – 3-5 mm – equant – iddingsite
Olivine crystals highly altered in the clasts and fairly fresh in the inner part of the flow.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-20% – 1-5 mm – sub-rounded – equant–
low vesicle content in the massive part of the flow
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: weakly (1/2 ft) in massive part of flow
Additional comments:
Some NaCl deposits on the massive inner part of the flow from R297-2.5.



Box #:	Cores in box
220	297 298 299

Loggers:	NB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

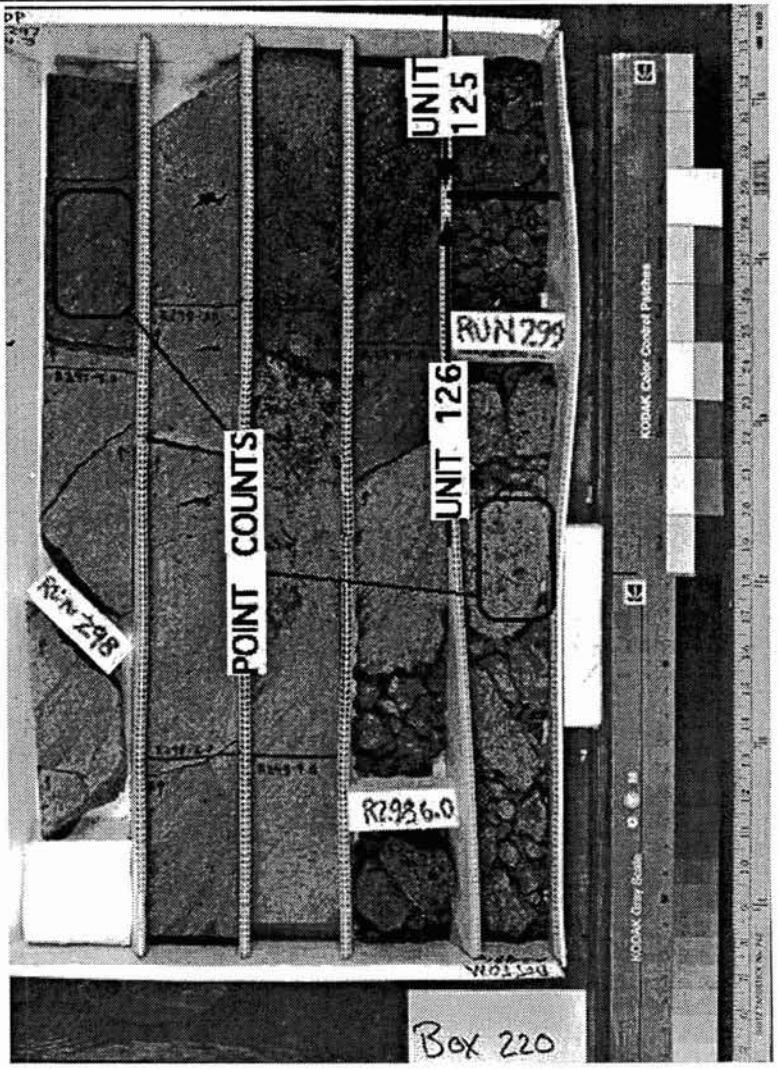
Driller's depth:top [feet]:	2017.8
Driller's depth:bottom [feet]:	2028.8
Core type:	HQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt **UNIT #: 125**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R 298 - 6.5 - 2026.0')(flow contact)
contact between 2 clastic zones having different coloration
Unit type: aa
plastic deformation features
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-13% – 3-5 mm – equant – iddingsite
Spinel inclusions. Olivine crystals fairly fresh in the inner part of the flow.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 2-5 mm – sub-angular – horizontally elongated –
Great variations in vesicles content. Holes formed by deformation of the molten rock.
Alteration: slightly (2-10% altered) –
Flow relatively fresh. Clasts highly altered.
Veins: none
Fractures: weakly: 9/7 ft
Additional comments:

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 126**

Contacts: Top (ft): (R 298 - 6.5 - 2026.0')(flow contact)
Bottom (ft): (R --')(continuous with next box)
Variations in clast coloration at the contact.
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-5 mm – equant – iddingsite
highly altered olivine crystals
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 4/2 grayish red – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant –
Alteration: highly (40-80% altered) –
red oxidation of the clasts
Veins: none
Fractures: rubble
Additional comments:



Box #: 221	Cores in box	
	299	302
	300	303
	301	

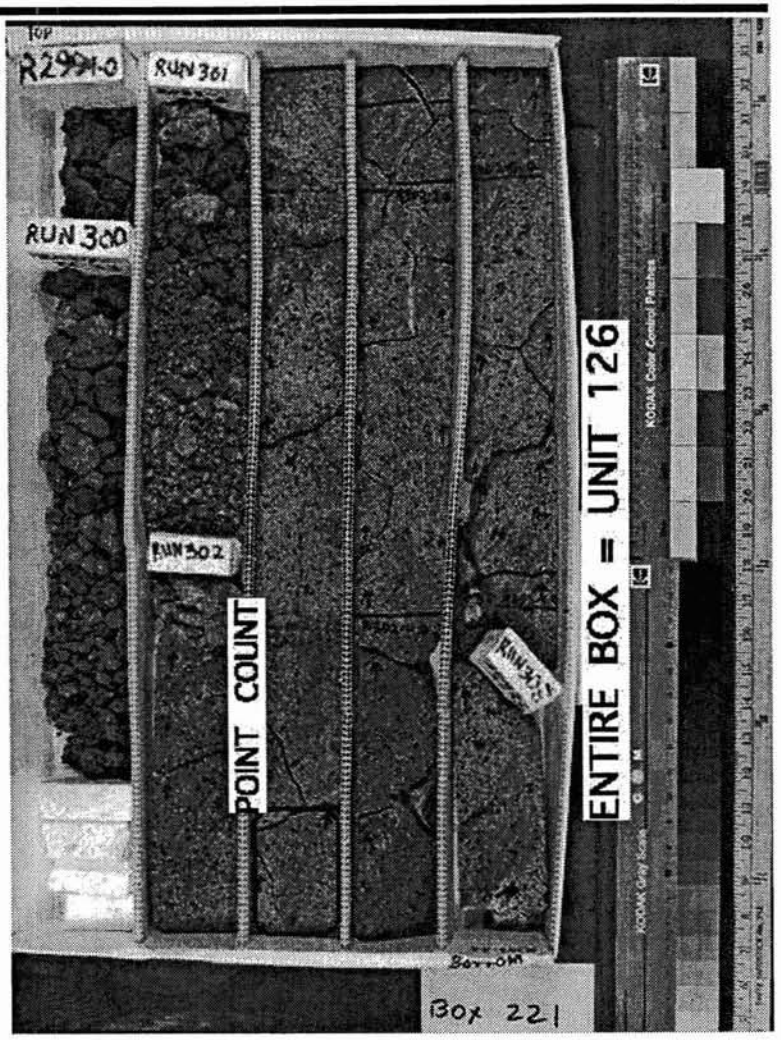
Loggers:	NB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	2028.8
Driller's depth:bottom [feet]:	2042.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:126

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
top of aa-type of flow
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 4-7 mm – equant – iddingsite
olivine crystals almost black
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: 1-10% – 7-10 mm – sub-angular – elongated–
Alteration: moderately (10-40% altered) –
Clasts are 100% altered. Alteration decreases from R302 to R302-2.0 in the inner part of the flow.
Veins: none
Fractures: Moderately: 7/2 ft; some fractures are filled by yellowish clay.
Additional comments:



Box #:	Cores in box
222	303

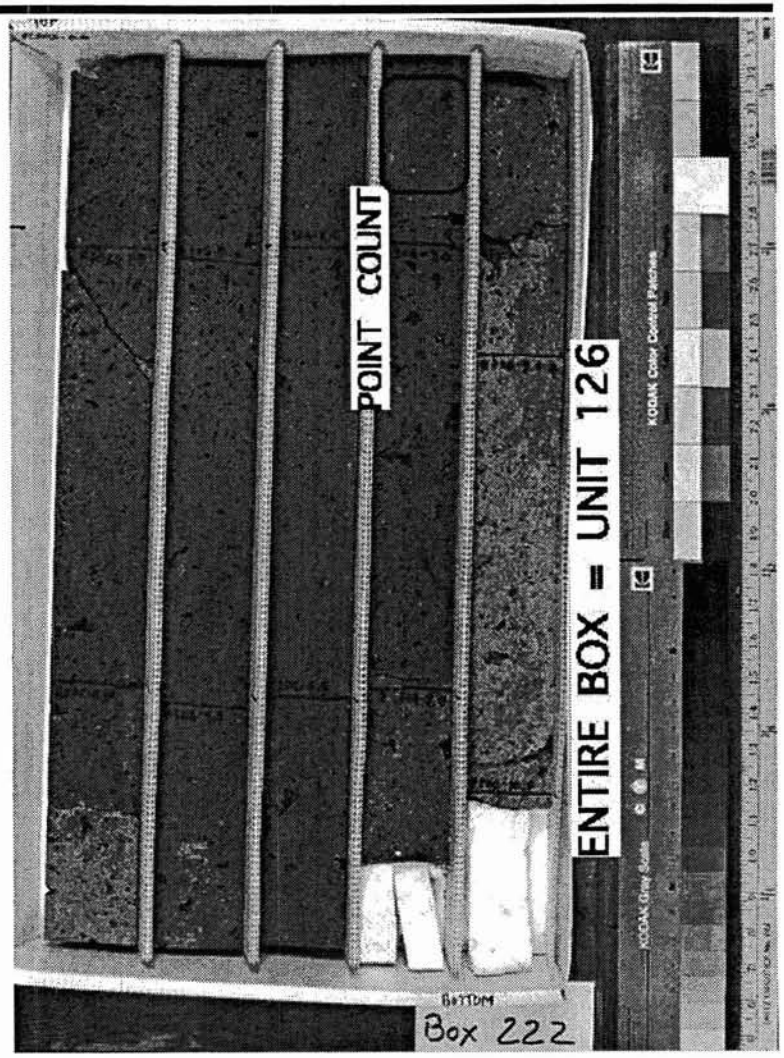
Loggers:	NB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	2042.6
Driller's depth:bottom [feet]:	2052.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:126

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa/transitional
Inner part of a thick flow
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 3-7 mm – equant – iddingsite
relatively fresh olivine crystals; 100 pts counted at R303-3.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-7% – 3-7 mm – sub-rounded – elongated –
Great variations in vesicles size and shape.
Alteration: moderately (10-40% altered) –
relatively fresh flow
Veins: none
Fractures: weakly: 6/10 ft; fractures filled by yellowish clay
Additional comments:
Fairly fresh inner part of a thick aa-type of flow.



Box #: 223

Cores in box 304

Loggers: NB
Date logged: 11/26/93
Checked by: MG
Check date: 12/12/93

Driller's depth:top [feet]: 2052.0
Driller's depth:bottom [feet]: 2061.2
Core type: HQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

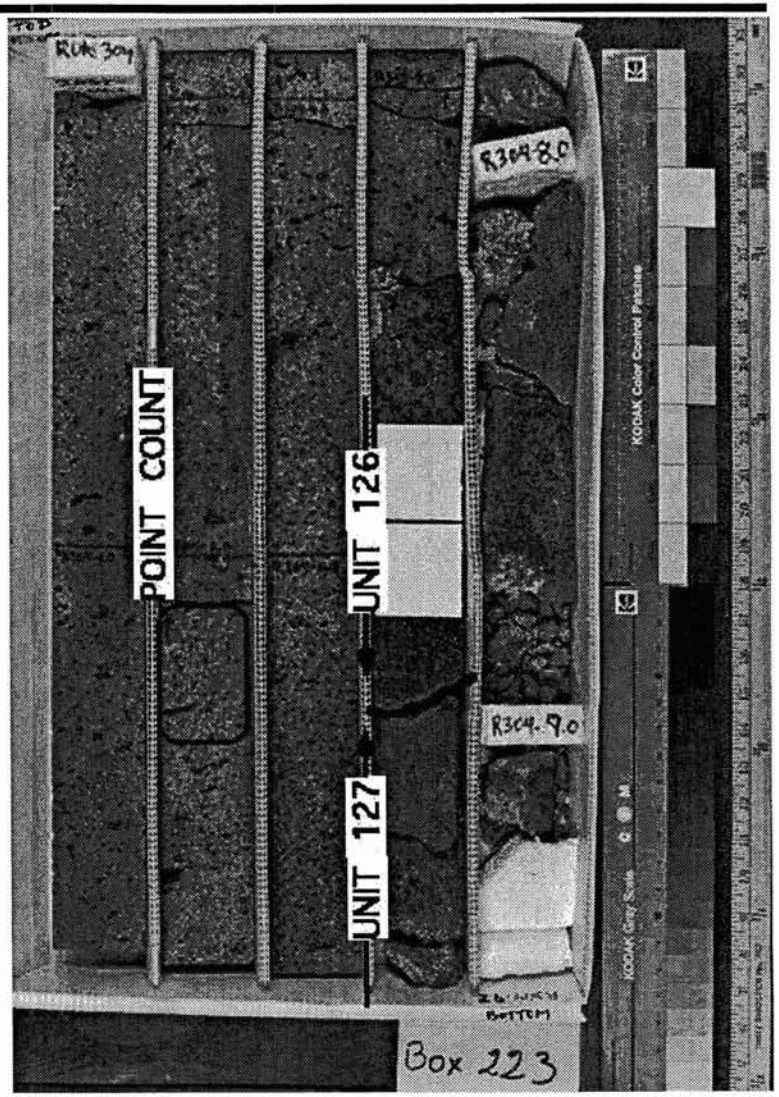
UNIT #: 126

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R304-7.3-2059.4')(flow contact)
very sharp contact with red oxidized material
Unit type: massive
no clasts at bottom of the flow
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 3-5 mm – equant and laths – iddingsite
some big crystals >10 mm (xenocrysts?)
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated –
long flattened vesicles
Alteration: moderately (10-40% altered) –
fairly fresh flow
Veins: none
Fractures: weakly: 5/6 ft
Additional comments:

BOX UNIT 2: aphyric basalt

UNIT #: 127

Contacts: Top (ft): (R 304-7.3-2059.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red alteration of the first 20 cm of the flow
Unit type: aa
top of aa-type of flow
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: 10-15% – 1-5 mm – spherical – equant –
clay
important variations in vesicle content
Alteration: slightly to highly (2-80% altered) –
highly altered clasts with yellowish clay and red oxidation
Veins: none
Fractures: moderately
Additional comments:



Box #:	Cores in box
224	304 305 306

Loggers:	NB
Date logged:	11/26/93
Checked by:	MG
Check date:	12/12/93

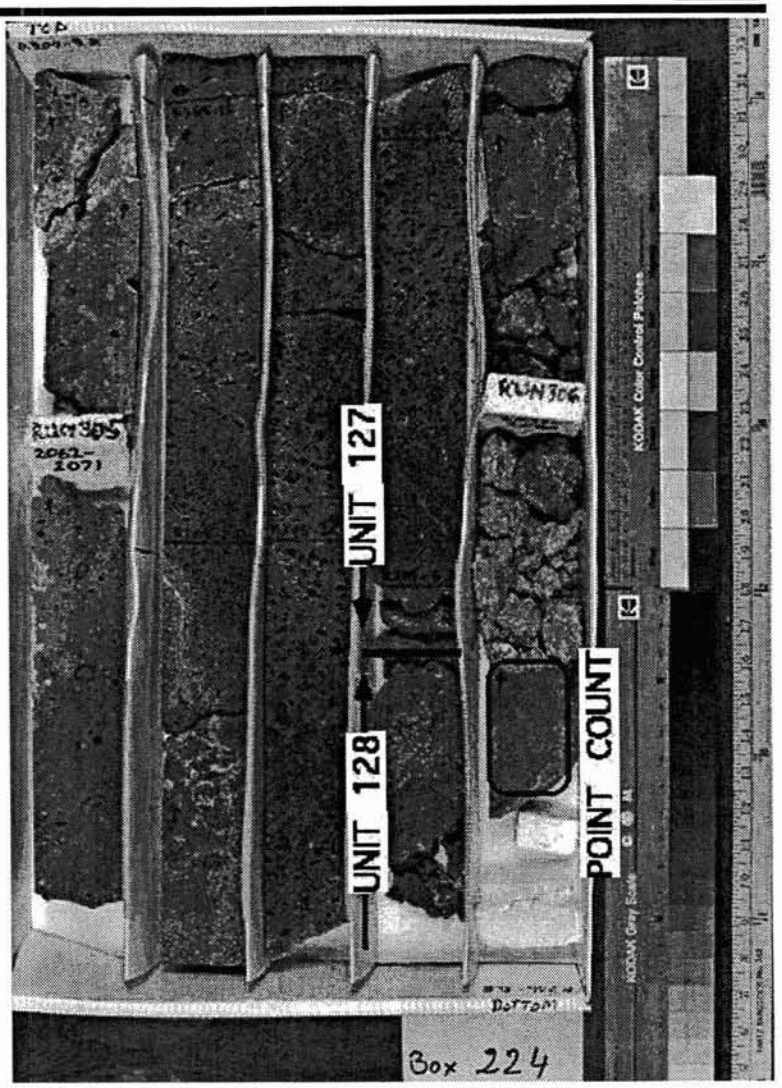
Driller's depth:top [feet]:	2061.2
Driller's depth:bottom [feet]:	2072.1
Core type:	HQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 127

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R305-6.1-2068.2')(flow contact)
Very brecciated contact with yellowish clay and red oxidation.
Unit type: aa
aa-type of flow with cavities
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-20% – 1-10 mm – sub-rounded – equant–
clay
Large variations in vesicle shape and volume. Clay coatings inside vesicles when close to the bottom and to fractures.
Alteration: moderately (10-40% altered) –
Clasts are almost 100% altered.
Veins: none
Fractures: 2 ~horizontal fractures filled with yellowish clay.
Additional comments:
NaCl deposits between R305-1.0 and R305-6.0

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 128

Contacts: Top (ft): (R305-6.1-2068.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Highly weathered contact. Yellowish clay and angular clasts.
Unit type: aa
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 2-3 mm – equant – iddingsite
Relatively fresh olivines close to the flow contact.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant–
clay
Vesicles irregularly distributed in the flow. Yellowish clay filling vesicles at the contact.
Alteration: moderately (10-40% altered) –
highly oxidized; clay
Veins: none
Fractures: rubbly
Additional comments:



Box #:	Cores in box
225	306 307

Loggers:	WRC
Date logged:	11/27/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	2072.1
Driller's depth:bottom [feet]:	2084.9
Core type:	HQ
Units in box:	1

BOX UNIT 1: sparsely olivine phyric basalt **UNIT #:128**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R307-2.8-2082.8')(flow contact)
Bottom of unit is marked by broken & rubbly zone and a change in vesicularity but no baked zone is observed.

Unit type: aa - pahoehoe
Upper part of unit down to R306-5.85 is an aa flow with rubble at its top and included autoliths. The bottom part of the unit is composed of several pahoehoe flows with internal ropy contacts at R306-7.4 and R307-0.7. Same lithology across all internal flow contacts.

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-5 mm – equant – iddingsite
Iddingsite occurs rimming grains or along fractures. Iddingsite is most prevalent just below each internal flow contact.
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) – Groundmass is rich in plagioclase (20-30%).

Color: N4 med. dark gray – **Structures:** – **Sorting:** –

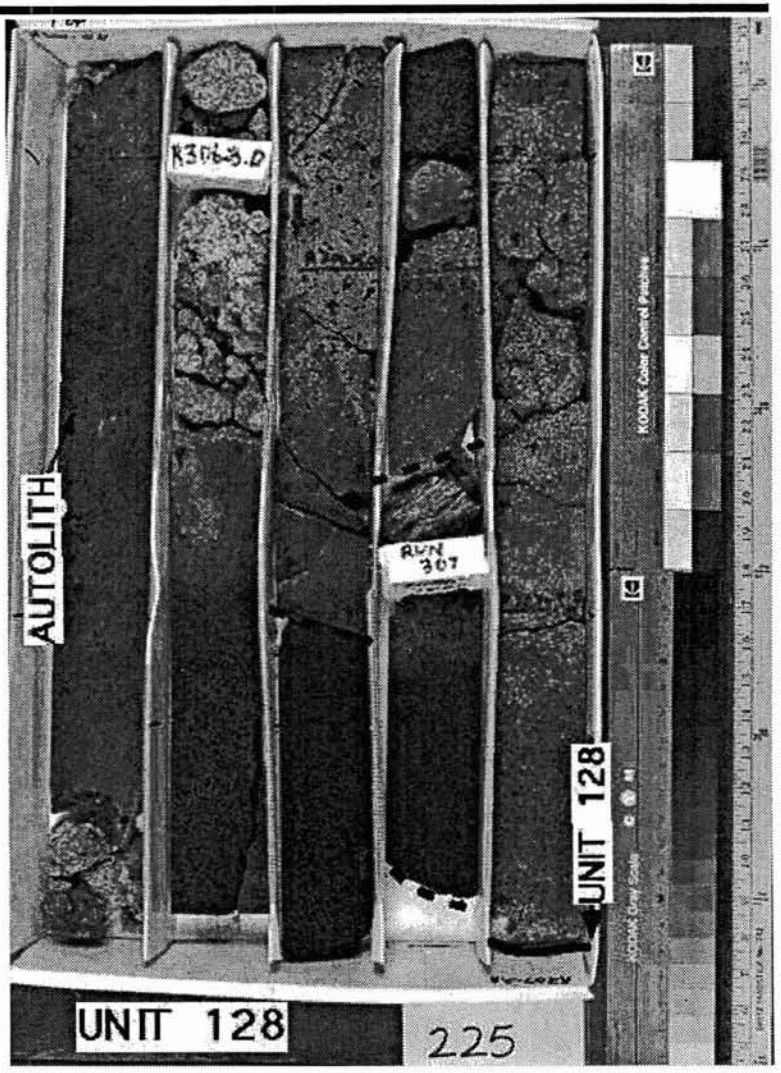
Vesicles: 10-20% – 1-5 mm – spherical to sub-angular – equant–
The vesicles in the aa flow at the top of the unit are generally sub-angular and more irregular with a larger diameter than those seen in the pahoehoe flows in the bottom portion of the unit. In the pahoehoe flows, the vesicles are spherical and small (<1 mm) near the internal flow contact and get larger with depth.

Alteration: slightly (2-10% altered) – hematite, clay(?)
Minor hematite near top and bottom of internal flows. Fracture surfaces and insides of adjacent vesicles are coated with a yellowish white clay(?).

Veins: none

Fractures: Fractures are generally narrow with opposite sides fitting together and coated with a yellowish-white clay(?). Unit is weakly fractured with a rubbly zone from R306-2.5 to R306-3.5 that also has yellowish-white clay(?) coatings on the rubble surfaces.

Additional comments:
Bottom of unit coincides with the bottom of the box.
Salt crusts readily form with drying on the cut surfaces of the pahoehoe sections.



Box #:	Cores in box
226	307 308 309

Loggers:	MBB
Date logged:	11/27/93
Checked by:	MG
Check date:	12/12/93

Driller's depth:top [feet]:	2084.9
Driller's depth:bottom [feet]:	2098.4
Core type:	HQ
Units in box:	2

BOX UNIT 1: sparsely olivine phyric basalt — UNIT #: 129

Contacts: Top (ft): (R307-2.8-**2082.8**')(flow contact)
Bottom (ft): (R308-4.8-**2090.7**')(flow contact)
Flow contact defined by a moderately oxidized clinkery zone above the contact and very highly oxidized basaltic clasts set in an oxidized matrix below the contact; this material is baked right at the contact.

Unit type: aa
classification based on the presence of clinkery material that grades into poorly vesicular massive core by R307-4.7

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant –
2% at R308-0.7; 1% at R308-3.7
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –

Color: N5 medium gray – **Structures:** – **Sorting:** –

Vesicles: 5-10% – <1-5 mm – rounded to angular – equant to elongate –
Below R308-2.0, vesicles increase in size and decrease in vol.% and are subhorizontal; above this depth, vesicles are subvertical.

Alteration: slightly to moderately (2-40% altered) –
Extent of groundmass oxidation increases toward contact.

Veins: none

Fractures: Between R307-2.8 and R308-4.8, core is rubbly; between R307-5.0 and R308-4.0, core is weakly fractured: 4/4.7 ft.

Additional comments:
groundmass plagioclase laths

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 130

Contacts: Top (ft): (R308-4.8-**2090.7**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
flow contact described in unit 1

Unit type: aa
very highly oxidized angular basalt clasts set in a friable oxidized matrix (see photo)

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant –
visually estimated mode; no obvious spinel inclusions
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –

Color: 10R 3/4 dark reddish brown – **Structures:** – **Sorting:** –

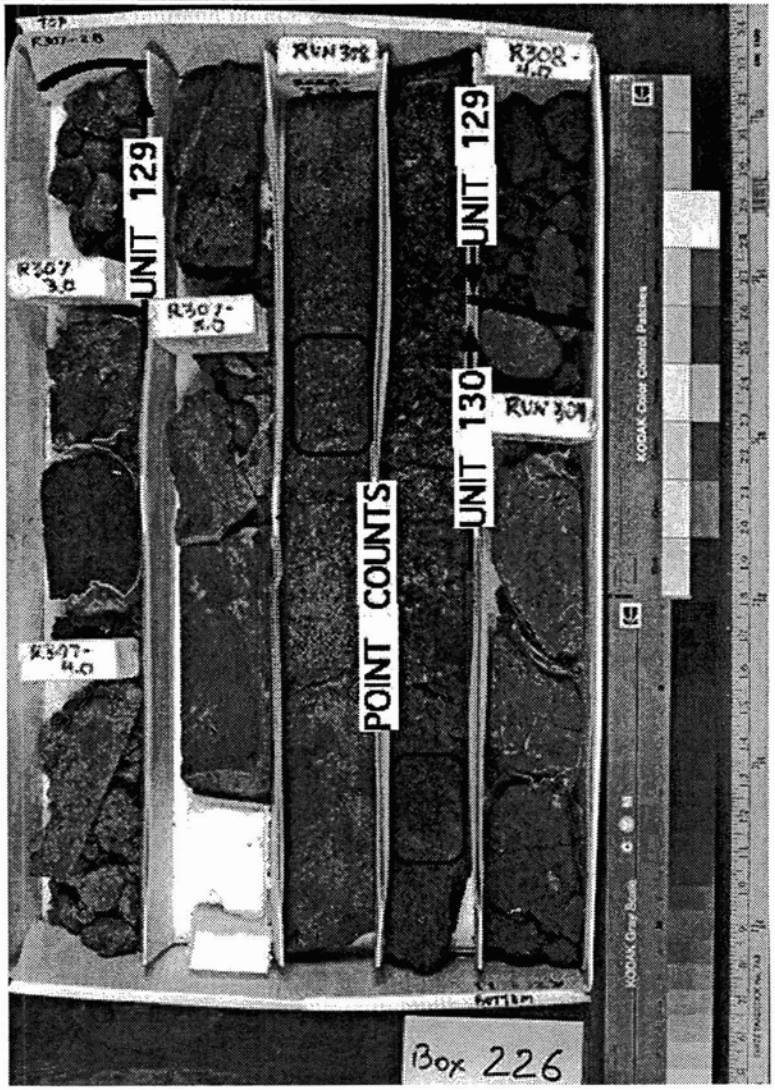
Vesicles: <15% – <1-3 mm – sub-angular – elongate –

Alteration: very highly to completely (80-100% altered) –
groundmass oxidation

Veins: none

Fractures: rubble

Additional comments:



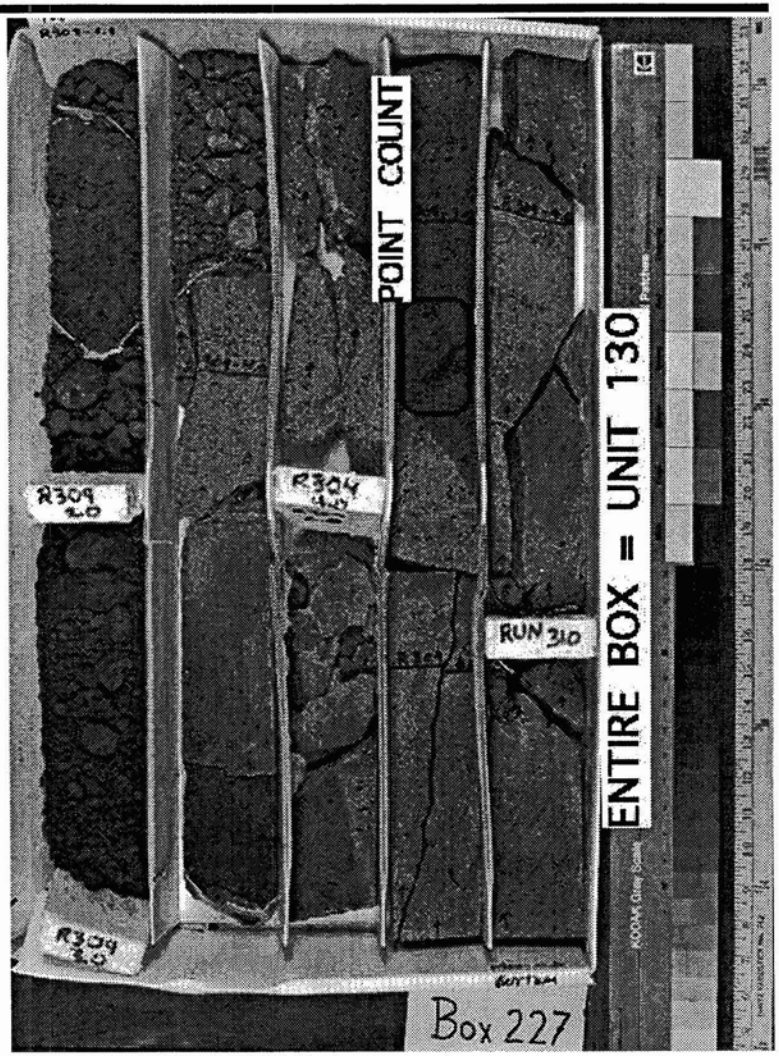
Box #:	Cores in box
227	309 310

Loggers:	MBB
Date logged:	11/28/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2098.4
Driller's depth:bottom [feet]:	2105.6
Core type:	HQ
Units in box:	1

BOX UNIT 1: sparsely olivine phyric basalt **UNIT #:130**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Highly oxidized rubbly zone grades into massive material by R309-3.7.
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant –
2% at R309-7.4; 1% at R309-9.6; spinel inclusions in the olivine phenocrysts; only very minor olivine oxidation
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-15% – <1-5 mm – subrounded to subangular – equant to elongate –
Orientation of elongate vesicles changes within section: vertical between R309-4.3 and 5.5 and generally horizontal between R309-6.0 and bottom of box.
Alteration: fresh to completely (<2-100% altered) –
Extent of groundmass oxidation decreases from top of box to R309-7.0 where the core is essentially fresh.
Veins: none
Fractures: weakly fractured: 18/7 ft; ivory-colored filaments partially cover some of the fracture surfaces
Additional comments:
plagioclase laths faintly visible in the groundmass



Box #: 228

Cores in box: 310

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2105.6
Driller's depth:bottom [feet]: 2113.9
Core type: HQ

Units in box: 2

BOX UNIT 1: sparsely olivine phyric basalt

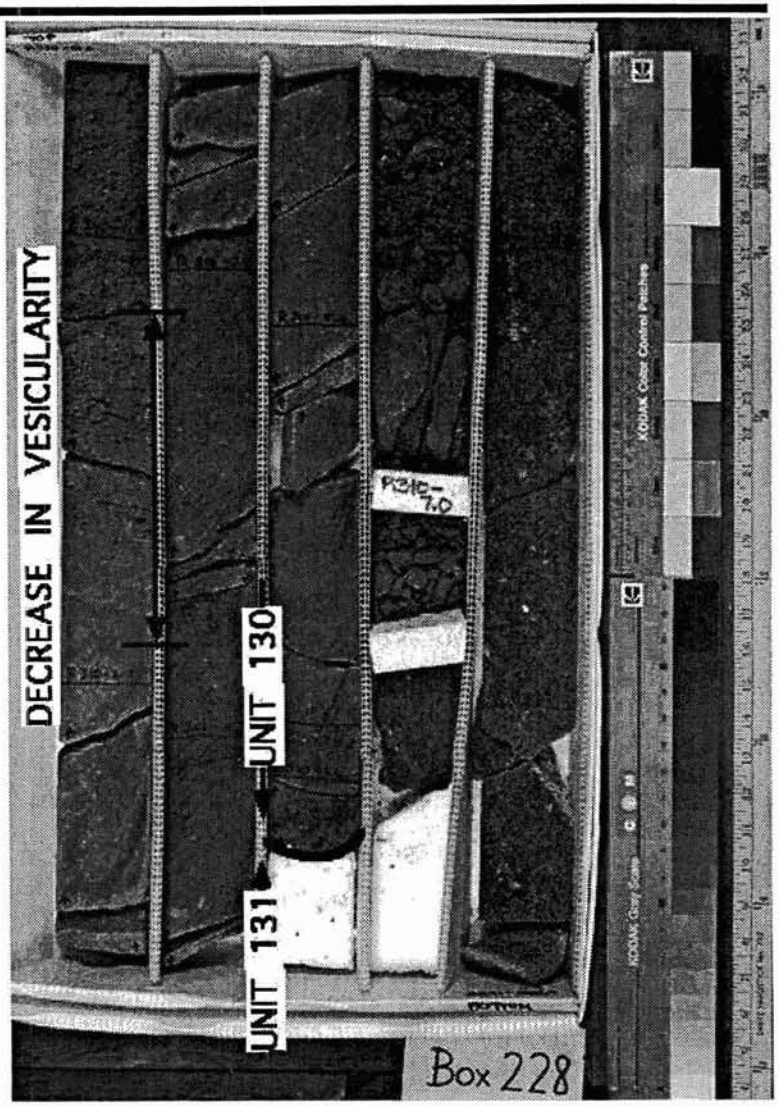
UNIT #: 130

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R310-6.2-2111.2')(flow contact)
red base and lithology change
Unit type: massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-3 mm – equant to blocky –
200 pts counted at R310-2.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10% above R310-1.5, <5% below – <1 to 3 mm – spherical – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 18/6 ft
Additional comments:
rare, small (~3 mm) gabbroic inclusions; rare plagioclase microphenocrysts (0.5 mm)

BOX UNIT 2: aphyric basalt

UNIT #: 131

Contacts: Top (ft): (R310-6.2-2111.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
orangish brown rubble on top
Unit type: pahoehoe
round, abundant vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 2-3 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 4/2 ft
Additional comments:



Box #:	Cores in box
229	310 311

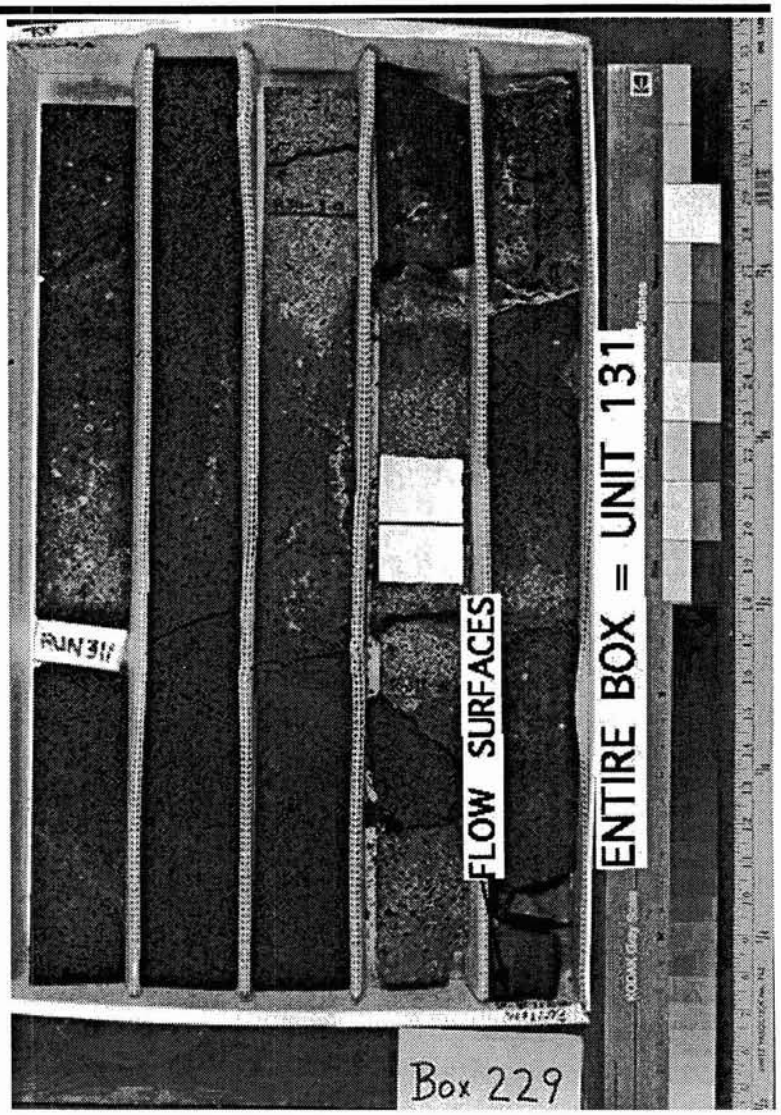
Loggers:	MG
Date logged:	11/28/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2113.9
Driller's depth:bottom [feet]:	2123.0
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:131

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
glassy flow surface at base of box
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – spherical – equant–
Alteration: slightly (2-10% altered) –
minor oxidation
Veins: none
Fractures: weakly: 11/8 ft
Additional comments:
NaCl ppt; possible K/Ar candidate



Box #: 230

Cores in box
311
312

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2123.0
Driller's depth:bottom [feet]: 2133.0
Core type: HQ

Units in box: 2

BOX UNIT 1: aphyric basalt

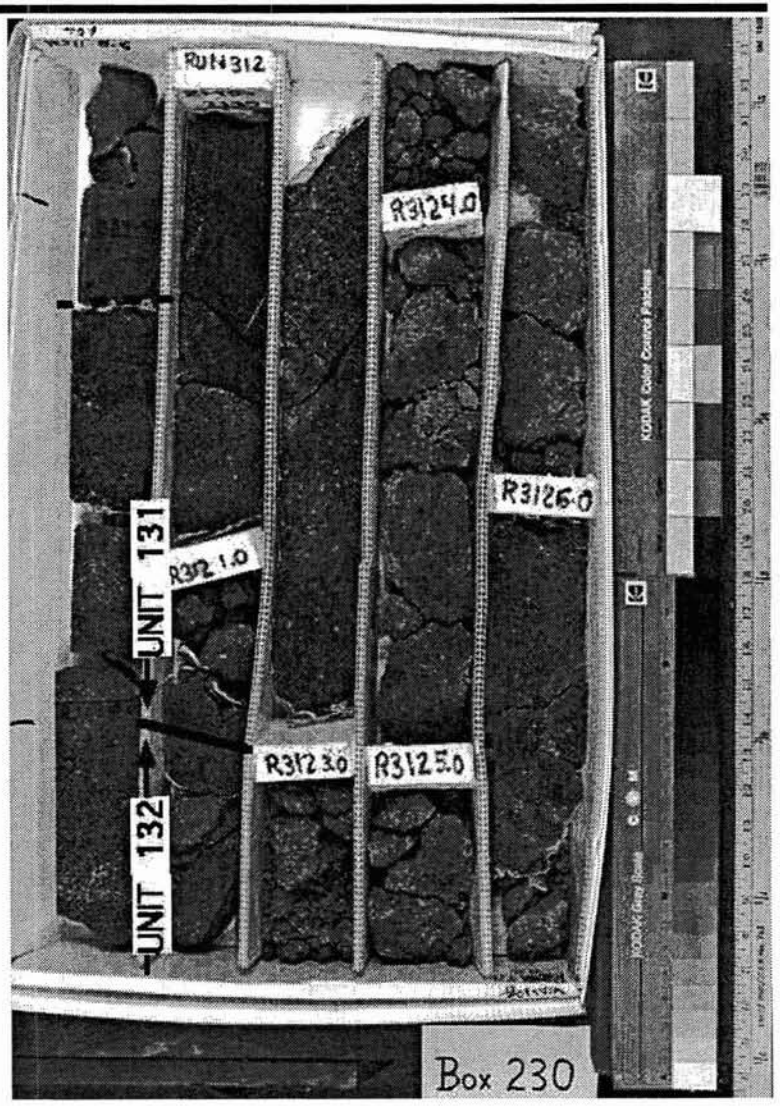
UNIT #: 131

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R312-1.3-2127.4')(flow contact)
red oxidized zone at base; lithology change
Unit type: pahoehoe
internal flow contact at R311-9.2
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – spherical – equant–
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: weakly: 5/3 ft
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 132

Contacts: Top (ft): (R 312-1.3-2127.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
lithology change
Unit type: aa
rubbly, mildly oxidized top
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-3 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-2 mm – sub-rounded – equant–
Alteration: moderately (10-40% altered) – clay and oxidation
Veins: none
Fractures: rubbly
Additional comments:



Box #:	Cores in box
231	312 313

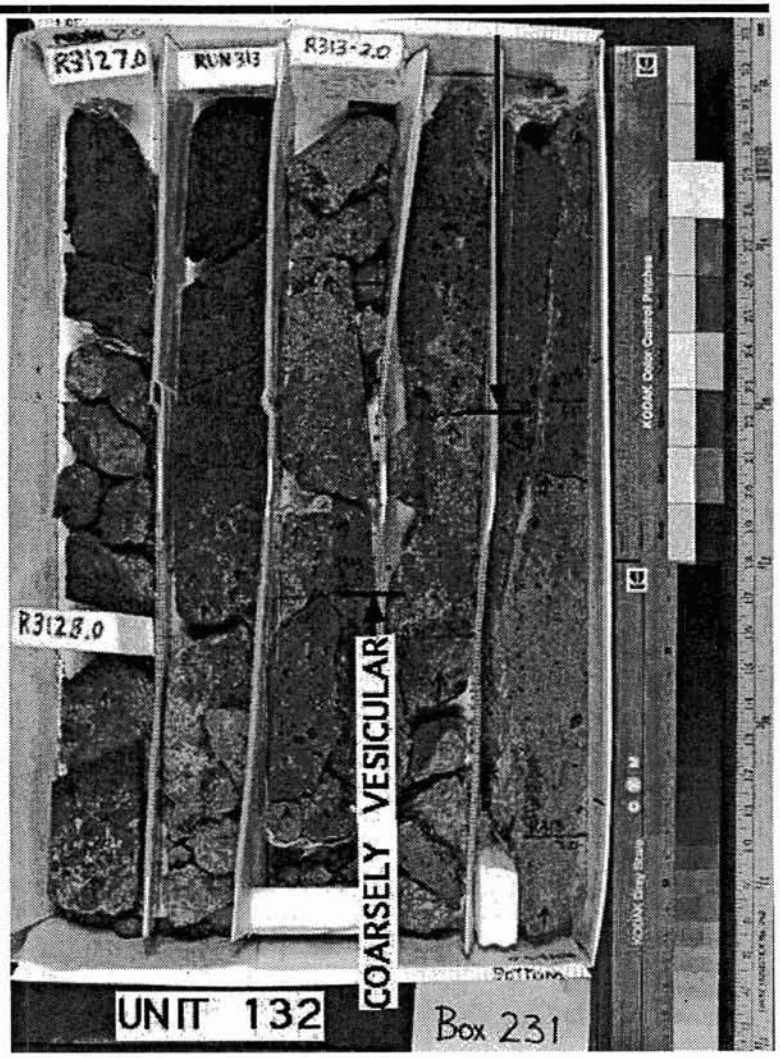
Loggers:	MG
Date logged:	11/28/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2133.0
Driller's depth:bottom [feet]:	2142.5
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:132

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-5 mm – equant to blocky –
200 pts counted at R313-6.5, rare 1 cm crystals
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-2 mm – sub-rounded – equant–
mostly small except between R313-2.0 to 4.0
Alteration: slightly (2-10% altered) –
oxidation with clay on fractures
Veins: none
Fractures: weakly (6/4 ft), but rubbly at top
Additional comments:



Box #: 232

Cores in box: 313, 314

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

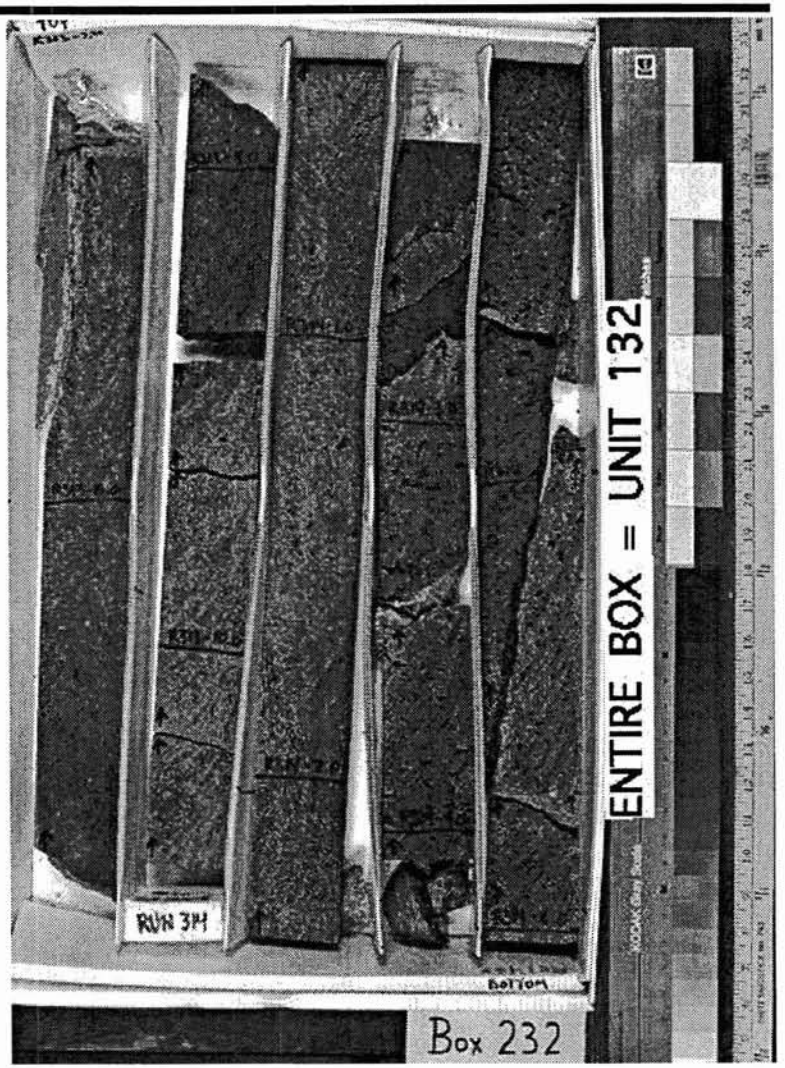
Driller's depth:top [feet]: 2142.5
Driller's depth:bottom [feet]: 2151.8
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:132

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-16% – 1-4 mm – equant to blocky –
200 pts counted at R313-9.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: <5% to 5-10% – 1-2 mm – sub-angular – equant–
change below R314-6.0 to: 10-20 %, 2-4 mm, sub rounded, horizontally elongate
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 5/6 ft
Additional comments:
NaCl ppt



Box #: 233

Cores in box
314
315

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/94

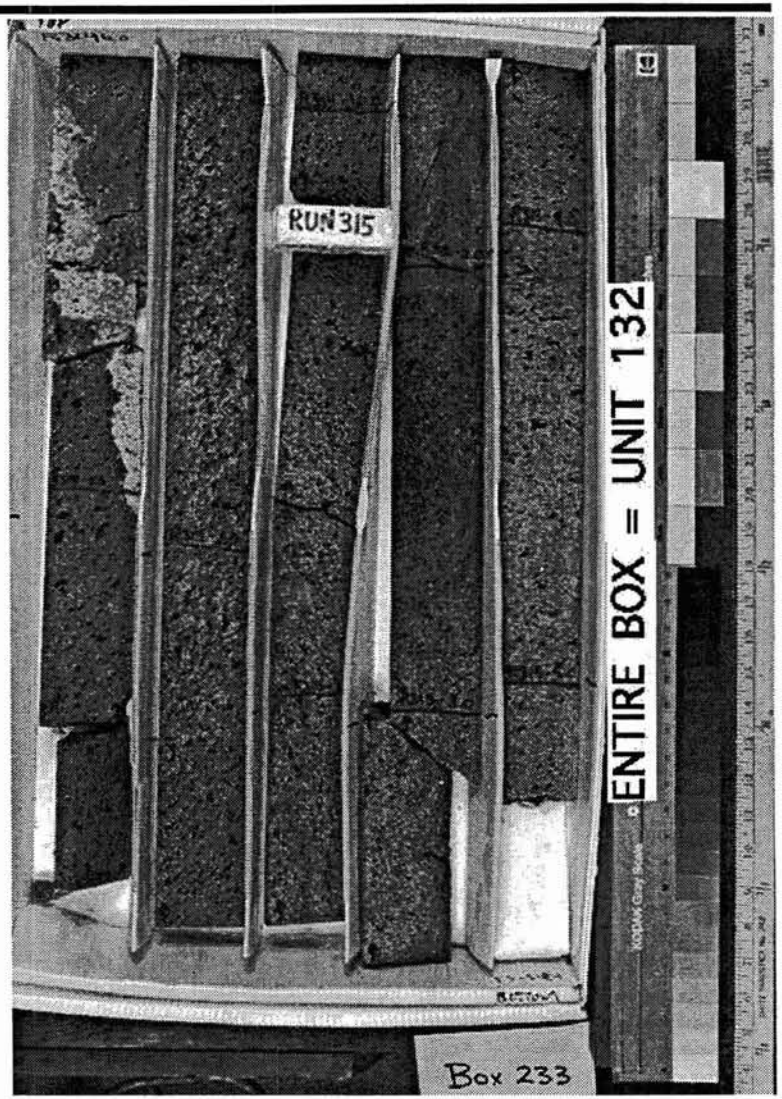
Driller's depth:top [feet]: 2151.8
Driller's depth:bottom [feet]: 2161.1
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:132

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-4 mm – equant to blocky –
200 pts counted at R315-3.0, multi-grain clusters
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – bimodal – sub-rounded – inclined (20°) –
<1 and 2-4 mm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 7/8 ft
Additional comments:
NaCl ppt



Box #: 234

Cores in box
315
316

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/94

Driller's depth:top [feet]: 2161.1
Driller's depth:bottom [feet]: 2169.8
Core type: HQ

Units in box: 3

BOX UNIT 1: highly olivine phyric basalt

UNIT #: 132

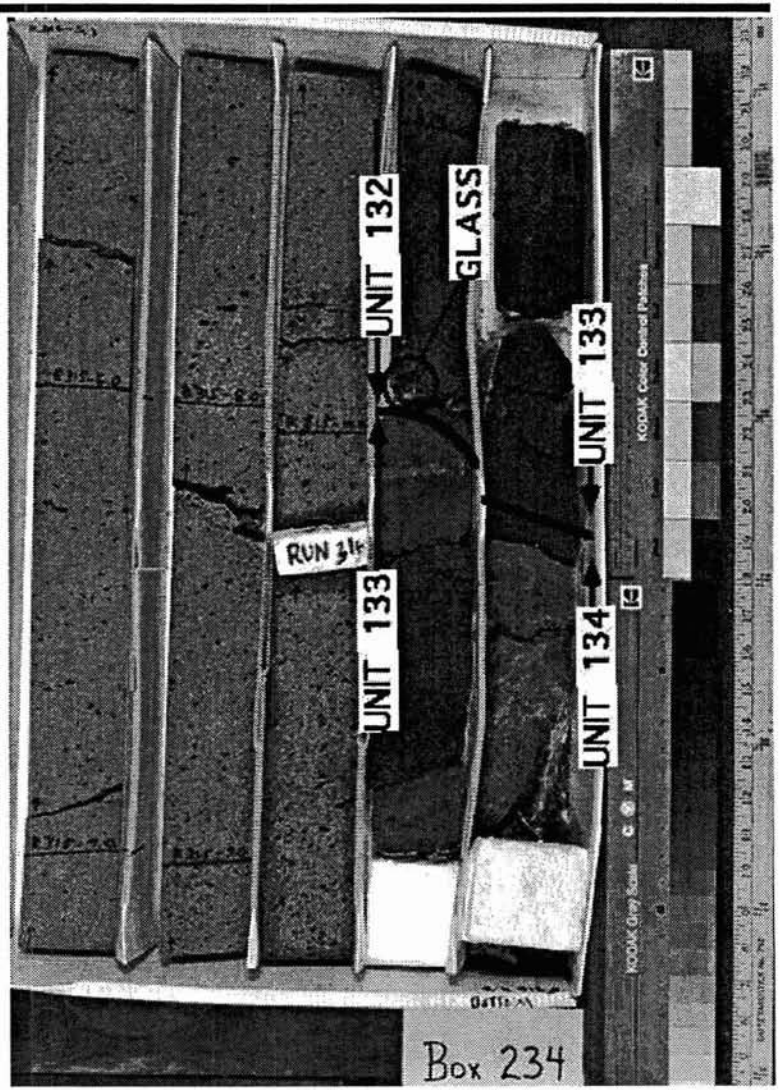
Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R316-1.8-2168.0')(flow contact)
base marked by 5 cm thick red soil/ash; glassy base
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 14-16% – 1-4 mm – equant to blocky –
100 pts counted at R315-7.5; multi-grain clusters
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-3 mm – sub-rounded – horizontally elongated to inclined –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 4/6 ft
Additional comments:
NaCl ppt; glass at base of flow at R316-1.8

BOX UNIT 2: moderately olivine phyric basalt

UNIT #: 133

Contacts: Top (ft): (R 316-1.8-2168.0')(flow contact)
Bottom (ft): (R316-3.6-2169.8')(Flow contact)
flow type change; distinct red contacts
Unit type: pahoehoe
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 4-6% – 1-3 mm – equant to blocky –
100 pts counted at R316-3.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R 3/4 dk. red. brown – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-2 mm – spherical – equant –
Alteration: moderately (10-40% altered) – clay and oxidation
Veins: none
Fractures: weakly: 6/2 ft
Additional comments:

BOX 234 CONTINUED ON NEXT PAGE



Box #: 234

Cores in box
315
316

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/94

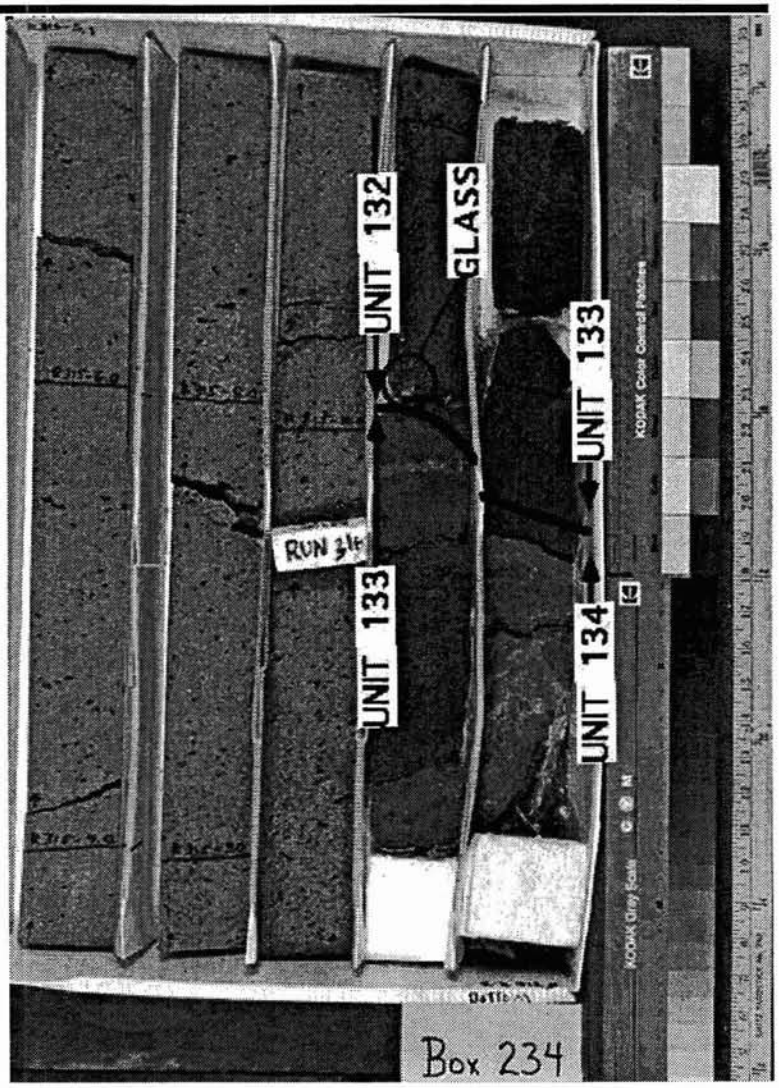
Driller's depth:top [feet]: 2161.1
Driller's depth:bottom [feet]: 2169.8
Core type: HQ

Units in box: 3

BOX UNIT 3: moderately olivine phyric basalt

UNIT #: 134

Contacts: Top (ft): (R 316-3.6-2169.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red, rubbly top
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 1-3 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10Y 3/4 dk. red. brown– **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1-3 mm – sub-rounded – vertically elongated–
Alteration: moderately (10-40% altered) – clay and oxidation
Veins: none
Fractures: rubbly
Additional comments:



Box #: 235

Cores in box
316
317

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2169.8
Driller's depth:bottom [feet]: 2179.2
Core type: HQ

Units in box: 3

BOX UNIT 1: moderately olivine phyric basalt

UNIT #: 134

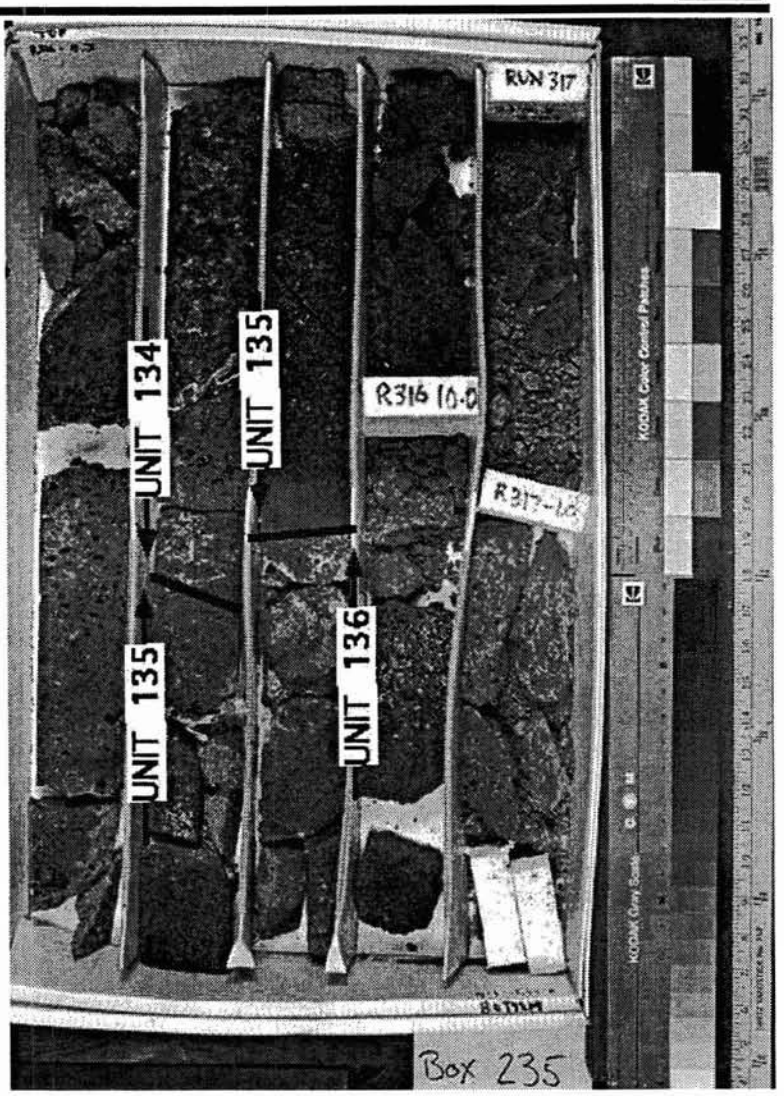
Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R316-7.2-2173.4')(flow contact)
red glassy base
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 1-3 mm – equant to blocky –
100 pts counted
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 411 brownish – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1 to 10 mm – spherical – equant to inclined –
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: weakly: 5/3 ft
Additional comments:
NaCl ppt

BOX UNIT 2: sparsely olivine phyric basalt

UNIT #: 135

Contacts: Top (ft): (R 316-7.2-2173.4')(flow contact)
Bottom (ft): (R316-8.7-2174.9')(flow contact)
glass at base and top contacts; lithology change
Unit type: pahoehoe
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: 10R 2/2 very dusky red – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-2 mm – spherical – equant –
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: weakly: 5/2 ft
Additional comments:

BOX 235 CONTINUED ON NEXT PAGE



Box #: 235

Cores in box
316
317

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

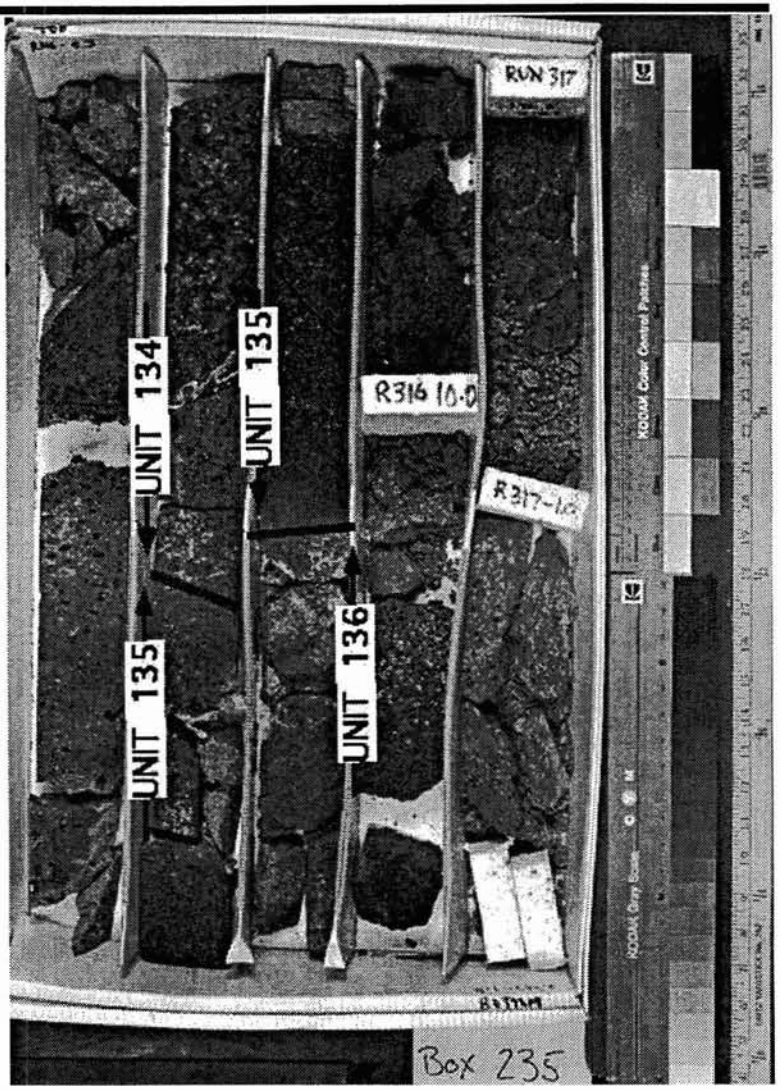
Driller's depth:top [feet]: 2169.8
Driller's depth:bottom [feet]: 2179.2
Core type: HQ

Units in box: 3

BOX UNIT 3: moderately olivine phyric basalt

UNIT #: 136

Contacts: Top (ft): (R 316-8.7-2174.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-7% – 1-3 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded – –
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: rubbly
Additional comments:



Box #: 236

Cores in box: 317

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

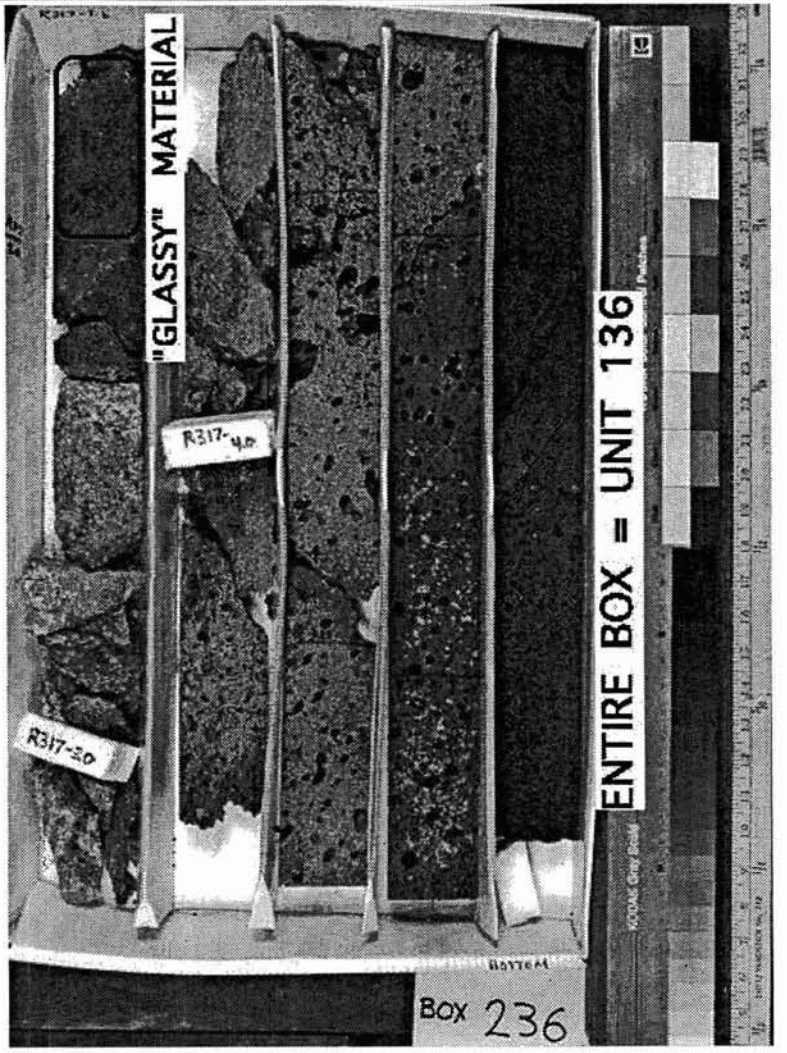
Driller's depth:top [feet]: 2179.2
Driller's depth:bottom [feet]: 2187.0
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:136

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15% – 1-3 mm – equant –
300 pts counted at R317-6.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 2-8 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 6/7 ft in lower part; upper part moderately fractured
Additional comments:
rare small (~3 mm) gabbroic inclusions; NaCl ppt
glassy interval at R317-1.6 to 2.0



Box #:	Cores in box
237	318 319

Loggers:	MG
Date logged:	11/28/93
Checked by:	MG
Check date:	12/13/93

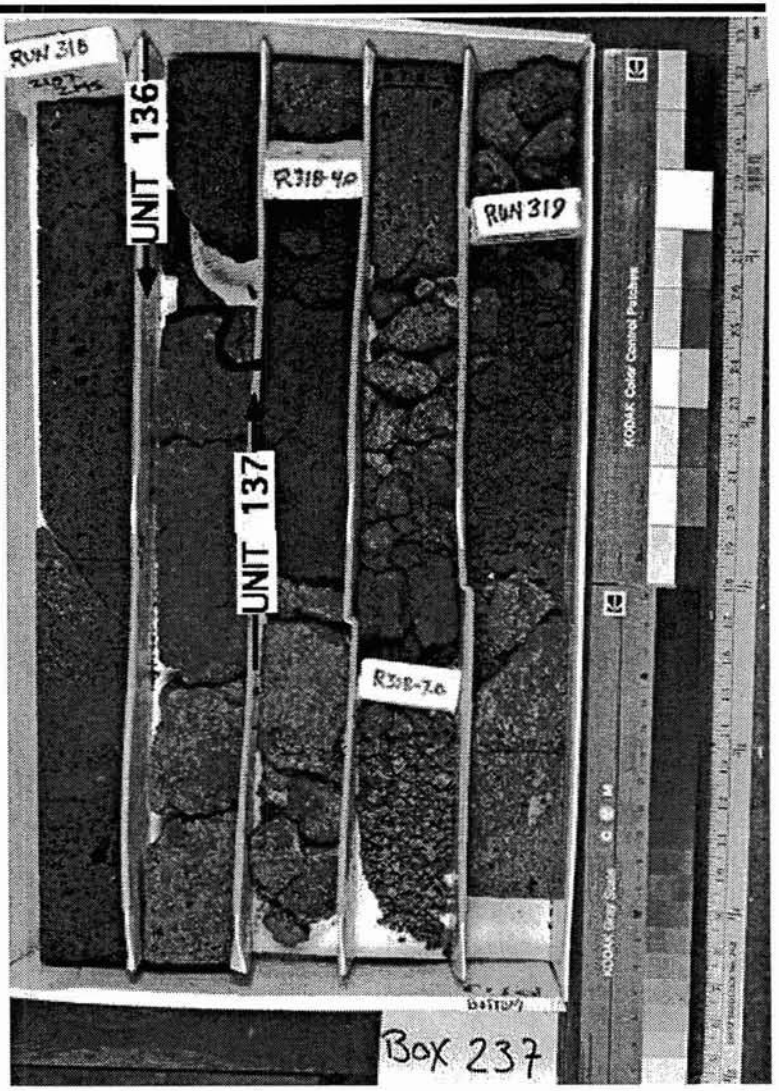
Driller's depth:top [feet]:	2187.0
Driller's depth:bottom [feet]:	2196.2
Core type:	HQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt **UNIT #: 136**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R318-2.5-2189.6')(flow contact)
distinct red base
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-7% – 1-3 mm – equant to blocky –
200 pts counted at R318-1.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-4 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 2/2 ft
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 137**

Contacts: Top (ft): (R318-2.5-2189.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red oxidized rubbly top
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-3 mm – equant –
visual estimate
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-4 mm – sub-angular – variable –
mostly rubble
Alteration: slightly to highly (2-80% altered) –
Veins: none
Fractures: rubbly
Additional comments:



Box #: 238

Cores in box: 319

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

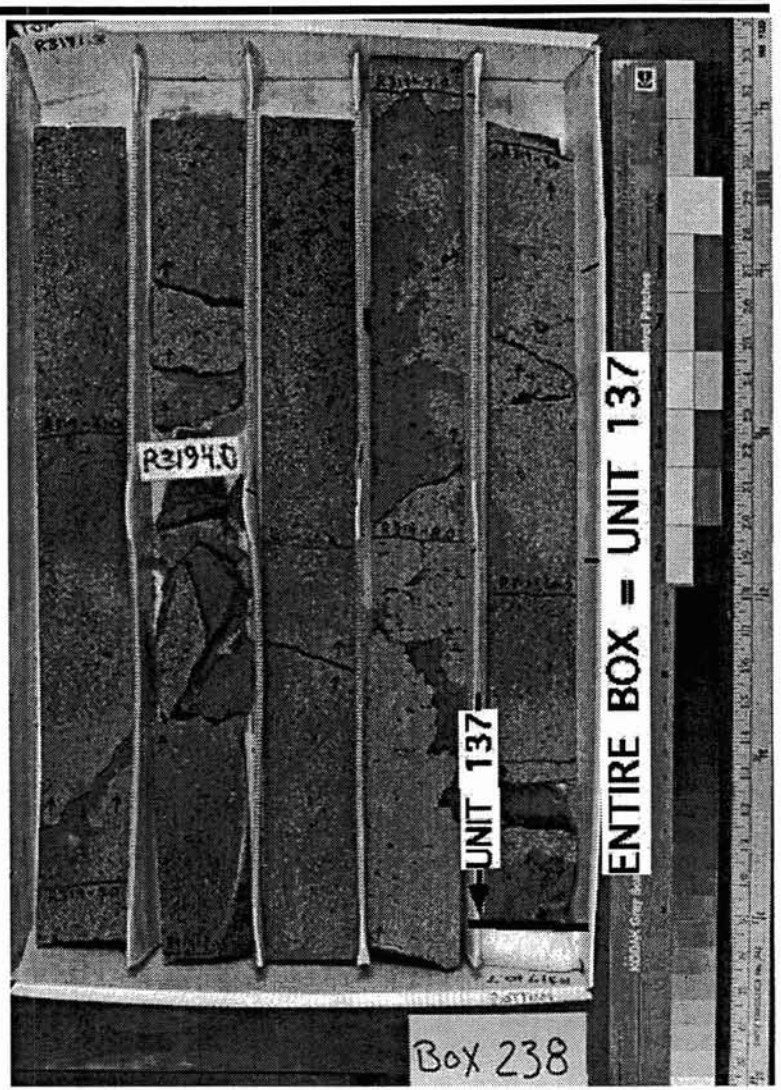
Driller's depth:top [feet]: 2196.2
Driller's depth:bottom [feet]: 2205.5
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:137

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R319-10.7-2205.7')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-3 mm – equant to blocky –
100 pts counted at R319-8.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1-5 mm – sub-rounded – horizontally elongated –
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 15/10 ft
Additional comments:
NaCl ppt; rare plagioclase microphenocrysts



Box #:	Cores in box
239	320 321

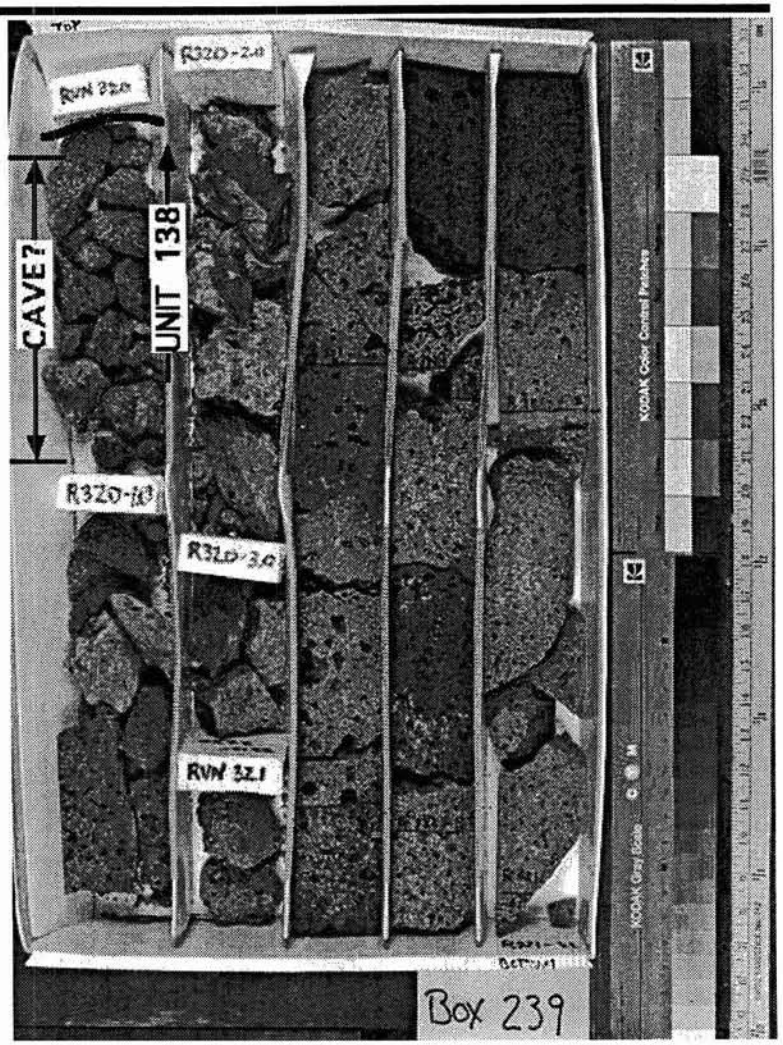
Loggers:	MG
Date logged:	11/28/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2205.5
Driller's depth:bottom [feet]:	2216.1
Core type:	HQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:138

Contacts: Top (ft): (R 320-0.0-**2205.7**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Upper ~1.0 ft of run (top of box) is rubble of mixed origin (cave?).
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-3 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – spherical – equant–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly, 14/6 ft
Additional comments:
NaCl ppt



Box #: 240

Cores in box
321
322

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

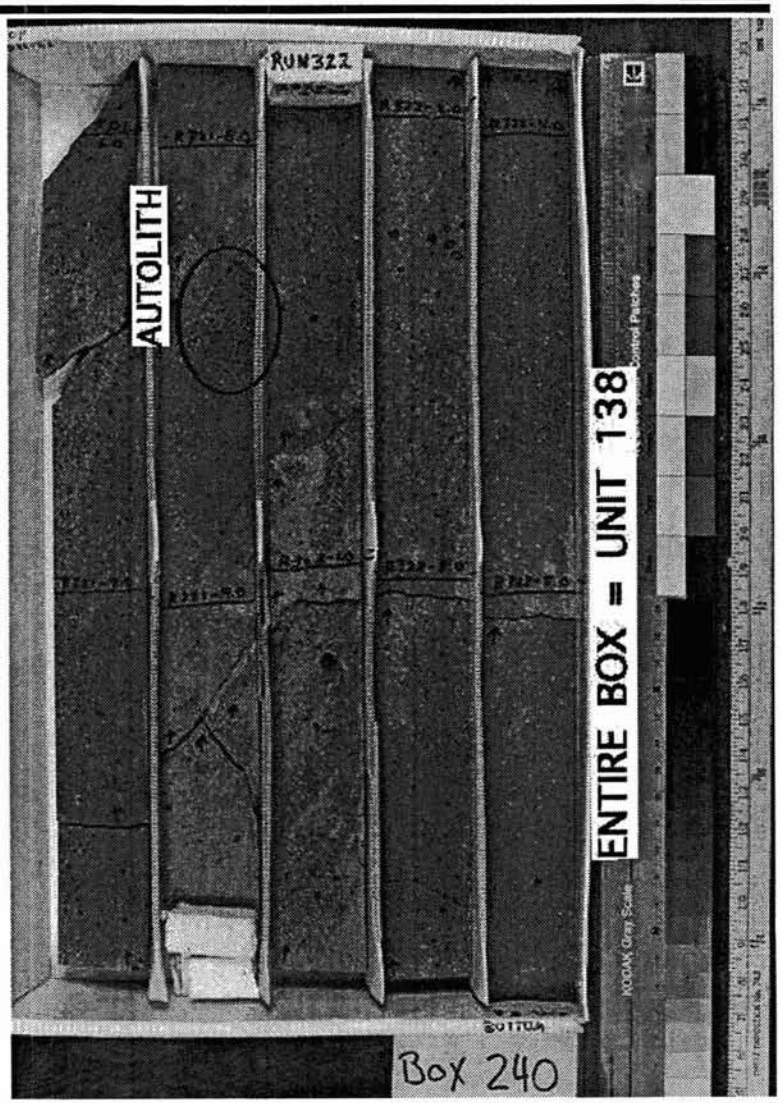
Driller's depth:top [feet]: 2216.1
Driller's depth:bottom [feet]: 2225.6
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:138

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-3 mm – equant –
100 pts counted at R322-3.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: <5 to 5-10% – 1-5 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 10/10 ft
Additional comments:
beautiful rock; autolith at R321-8.3



Box #: 241

Cores in box
322
323

Loggers: MG
Date logged: 11/28/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2225.6
Driller's depth:bottom [feet]: 2234.5
Core type: HQ

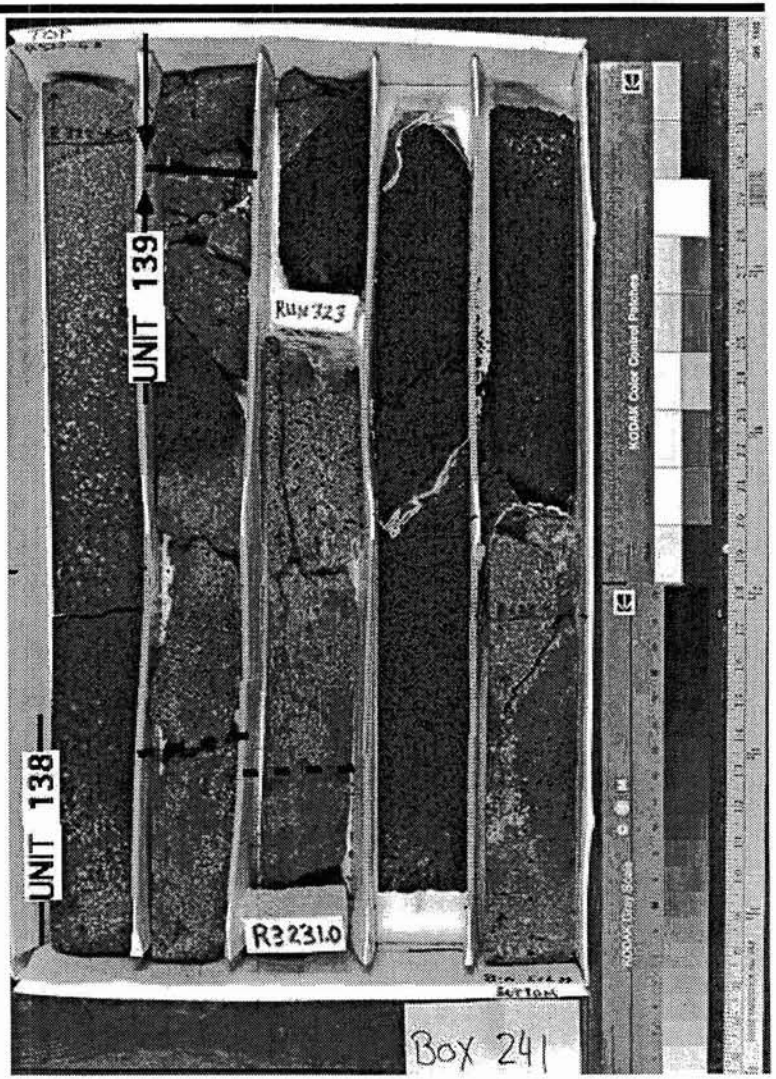
Units in box: 2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 138

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R322-8.0-2227.7')(flow contact)
red oxidized base; lithology change
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-8% – 1-3 mm – equant –
100 pts counted at R322-6.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 1/2 ft
Additional comments:
NaCl ppt, glass at base
less olivine than overlying rock of same unit

BOX UNIT 2: aphyric basalt — UNIT #: 139

Contacts: Top (ft): (R 322-8.0-2227.7')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-3 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 7/6 ft
Additional comments:
NaCl ppt; internal contacts at R322-9.5 and R323-0.8 (glassy contacts but no lithology change)



Box #: 242

Cores in box: 323, 324

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2234.5
Driller's depth:bottom [feet]: 2246.0
Core type: HQ

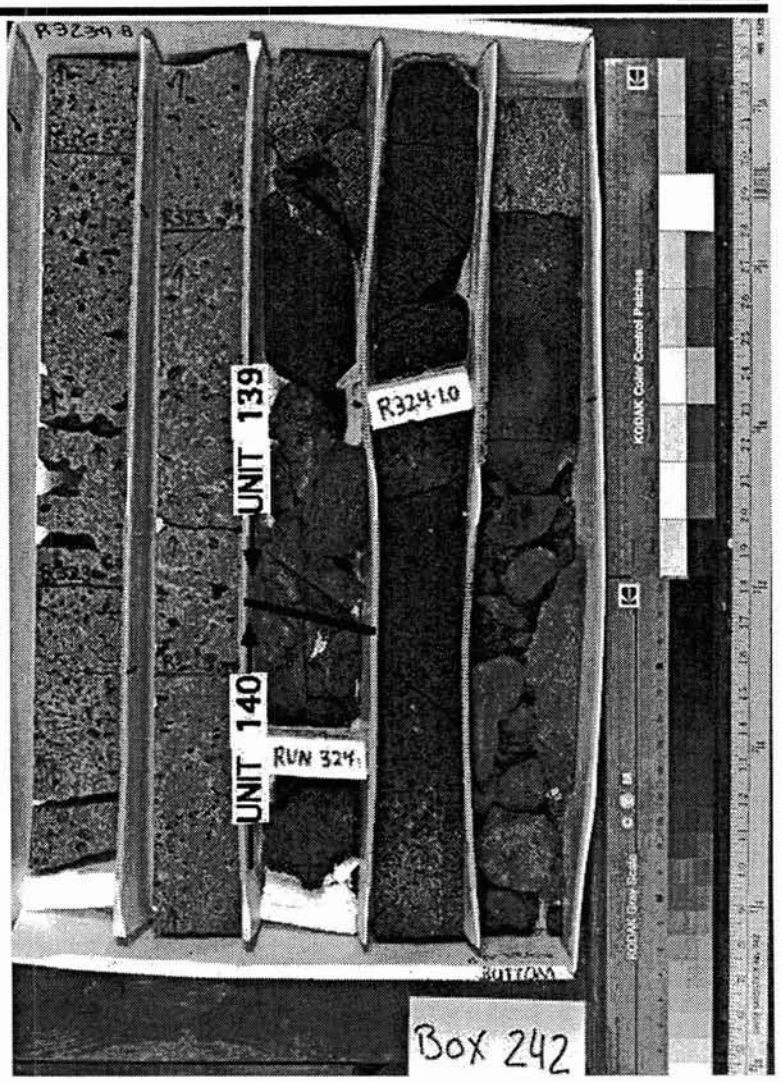
Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 139

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R323-9.5-2239.4')(flow contact)
basal surface oxidized rubble
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1 and 3-5 mm – spherical – equant to horizontally elongated – some >1 cm size; plagioclase crystals in vesicles
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 4/4 ft
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 140

Contacts: Top (ft): (R 323-9.5-2239.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
reddish stain on rubble
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 2-3 mm – blocky (<3:1:1) –
xenocrysts?
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: rubbly to weakly (6/3 ft)
Additional comments:



Box #: 243

Cores in box
324
325

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2246.0
Driller's depth:bottom [feet]: 2254.1
Core type: HQ

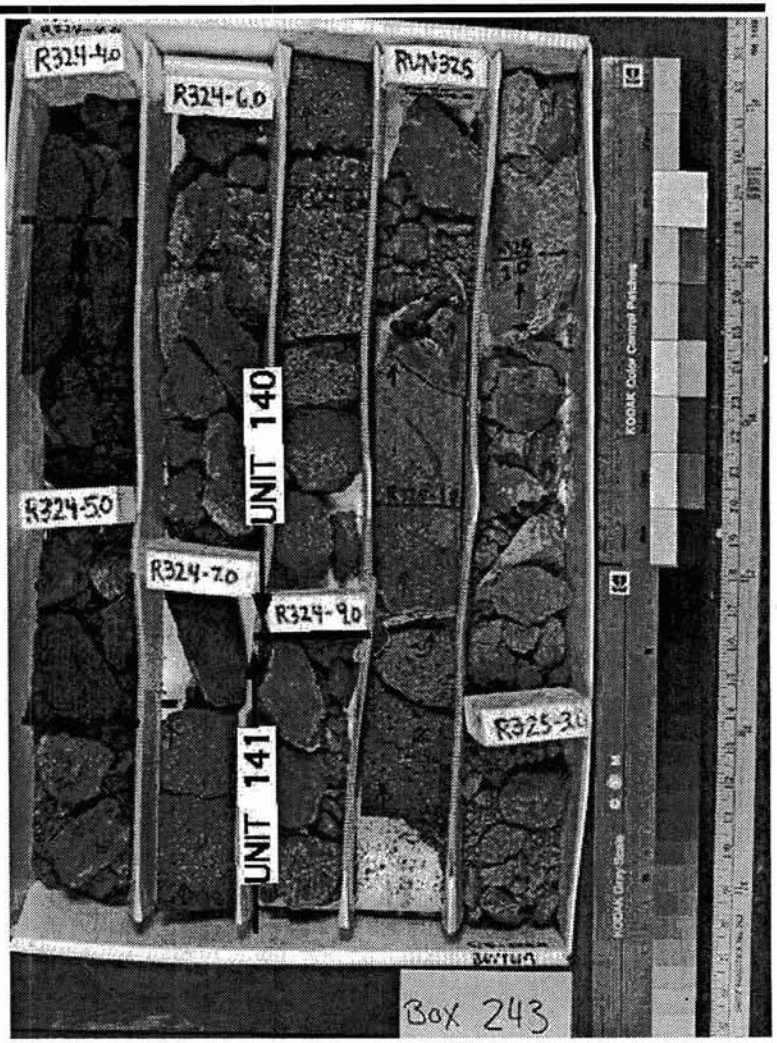
Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 140

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R324-9.0-**2249.0**')(flow contact)
unit contact picked based on lithology change (rare plagioclase); internal contacts (flow surfaces) with red stain at R324-4.5, 5.3, 7.0
Unit type: transitional
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 2 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-3 mm – spherical – equant–
Alteration: slightly to moderately (2-40% altered) – clay oxidation
Veins: none
Fractures: rubbly to moderately: 5/1 ft
Additional comments:

BOX UNIT 2: aphyric basalt — UNIT #: 141

Contacts: Top (ft): (R 324-9.0-2249.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 2-3 mm – blocky (<3:1:1) –
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1 to 3 mm – sub-angular – inclined – highly variable %
Alteration: fresh to moderately (<2-40% altered) – clay rubble zone most altered
Veins: none
Fractures: rubble
Additional comments:



Box #:	Cores in box
244	325 326 327

Loggers:	MG
Date logged:	11/29/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2254.1
Driller's depth:bottom [feet]:	2262.2
Core type:	HQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:141

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-5 mm – blocky (<3:1:1) –
plagioclase – <1% – 1-5 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% – <1 mm – sub-angular – inclined–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly (1/2 ft) to rubbly
Additional comments:
internal rubble zone at R325-3.3, but no change in this distinct lithology (rare plagioclase and olivine)

Box #:	Cores in box
245	327 328

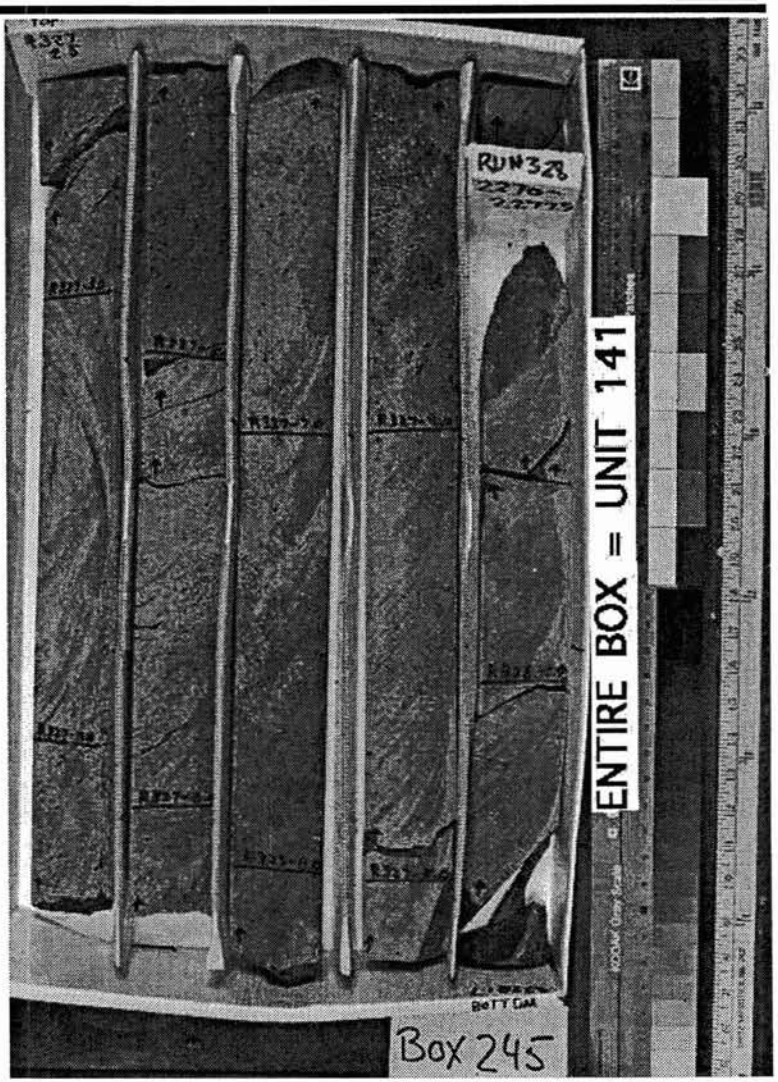
Loggers:	MG
Date logged:	11/29/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2262.2
Driller's depth:bottom [feet]:	2274.7
Core type:	HQ
Units in box:	1

BOX UNIT 1: sparsely olivine phyric basalt

UNIT #:141

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – ~1% – 2-4 mm – blocky (<3:1:1) –
plagioclase – <1% – 1-2 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 to N5, med. dk. to med. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1 mm – sub-rounded – horizontally elongated – decreasing towards base of box
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 9/10 ft
Additional comments:
rare large olivine and plagioclase crystals (xenocrysts?)



Box #: 246

Cores in box
328
329

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2274.7
Driller's depth:bottom [feet]: 2283.7
Core type: HQ

Units in box: 2

BOX UNIT 1: aphyric basalt

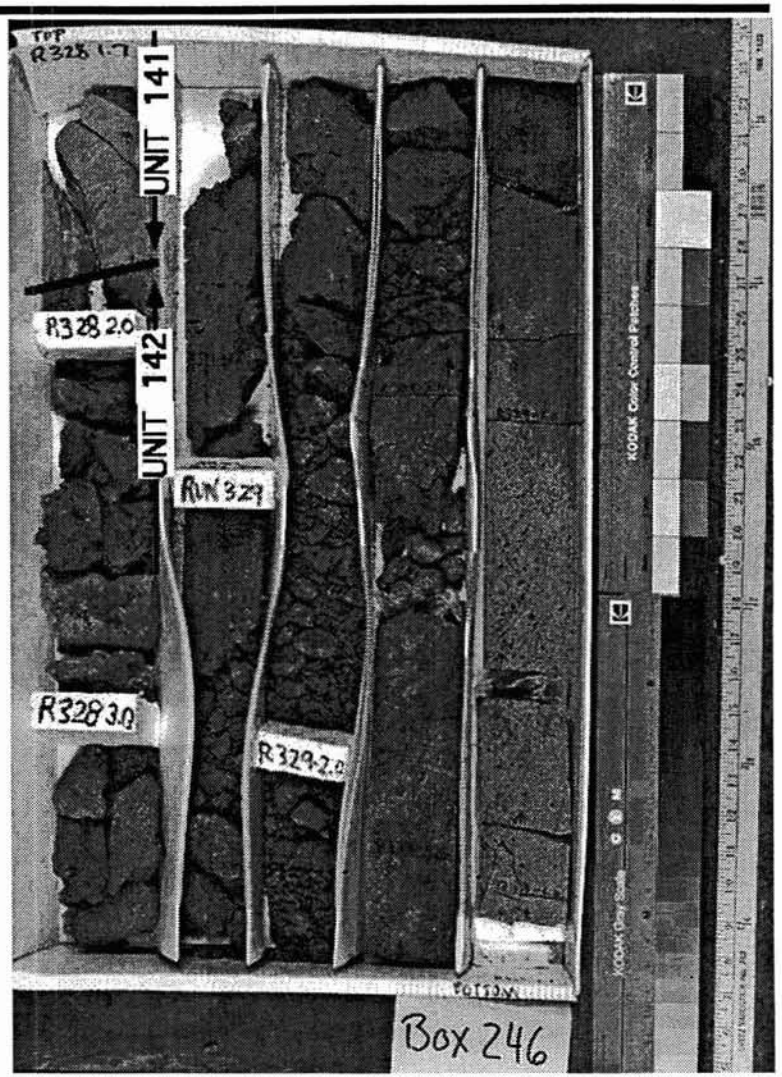
UNIT #: 141

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R328-1.9-2272.5')(flow contact)
minor lithology change (less olivine and no plagioclase), but strong red baked zone
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 2-3 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-3 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: moderately: 2/0.4 ft
Additional comments:

BOX UNIT 2: aphyric basalt

UNIT #: 142

Contacts: Top (ft): (R 328-1.9-2272.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red baked top
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1 to 3 mm – sub-angular – inclined –
Alteration: slightly (2-10% altered) – clay
decreasing alteration with depth
Veins: none
Fractures: weakly: 6/2 ft to rubbly
Additional comments:



Box #: 247

Cores in box
329
330
331

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2283.7
Driller's depth:bottom [feet]: 2296.4
Core type: HQ

Units in box: 2

BOX UNIT 1: aphyric basalt

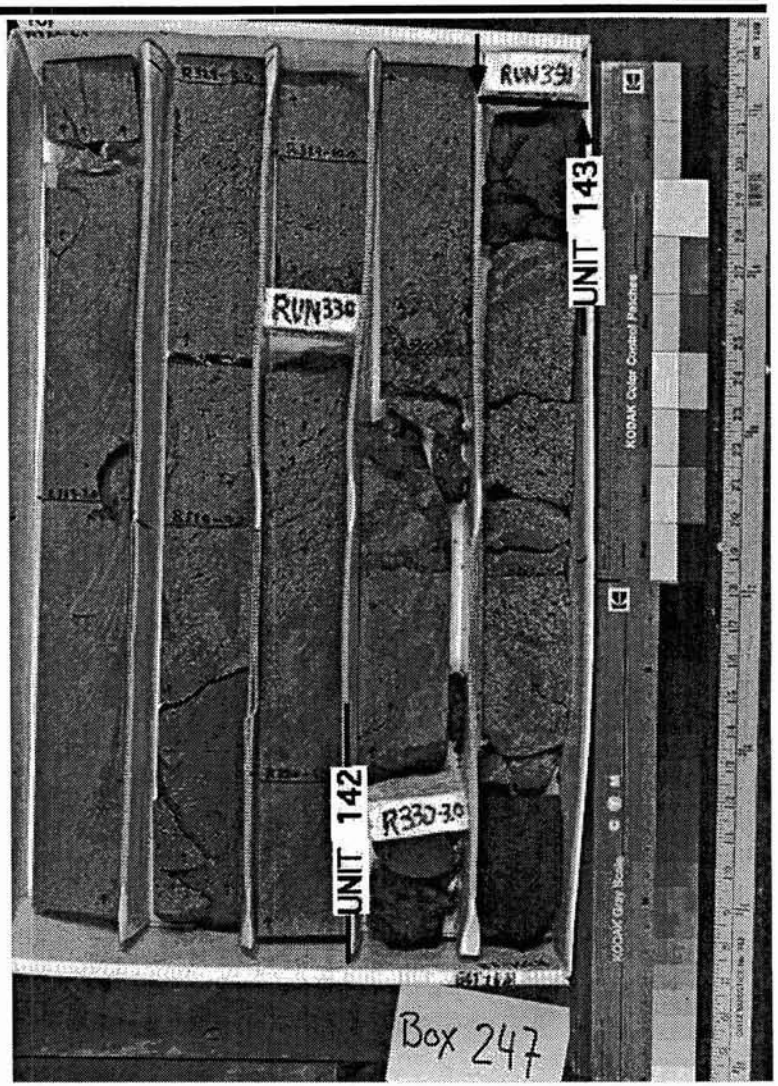
UNIT #: 142

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R331-0.0-2291.5')(flow contact)
contact lost at base of run 330
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% to 10-20% – <1-5 mm – sub-angular – inclined –
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: weakly: 6/5 ft
Additional comments:

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 143

Contacts: Top (ft): (R 331-0.0-2291.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-3 mm – equant to blocky –
visual estimate
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 lt. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – angular – equant –
Alteration: moderately to highly (10-80% altered) – clay
Veins: none
Fractures: rubble
Additional comments:



Box #: 248

Cores in box
331
332

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2296.4
Driller's depth:bottom [feet]: 2309.2
Core type: HQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

UNIT #: 143

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R332-1.6-2303.6')(flow contact)
internal flow contact at R331-6.1
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15% – 1-4 mm – equant to blocky –
100 pts at R331-5.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1 to 4 mm – spherical – equant –
zones have 20-30%
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: weakly
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 144

Contacts: Top (ft): (R 332-1.6-2303.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
rubbly oxidized top
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-4 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-3 mm – – –
Alteration: moderately to highly (10-80% altered) – clay
oxidized
Veins: none
Fractures: rubbly
Additional comments:

Box #: 249

Cores in box
332
333

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

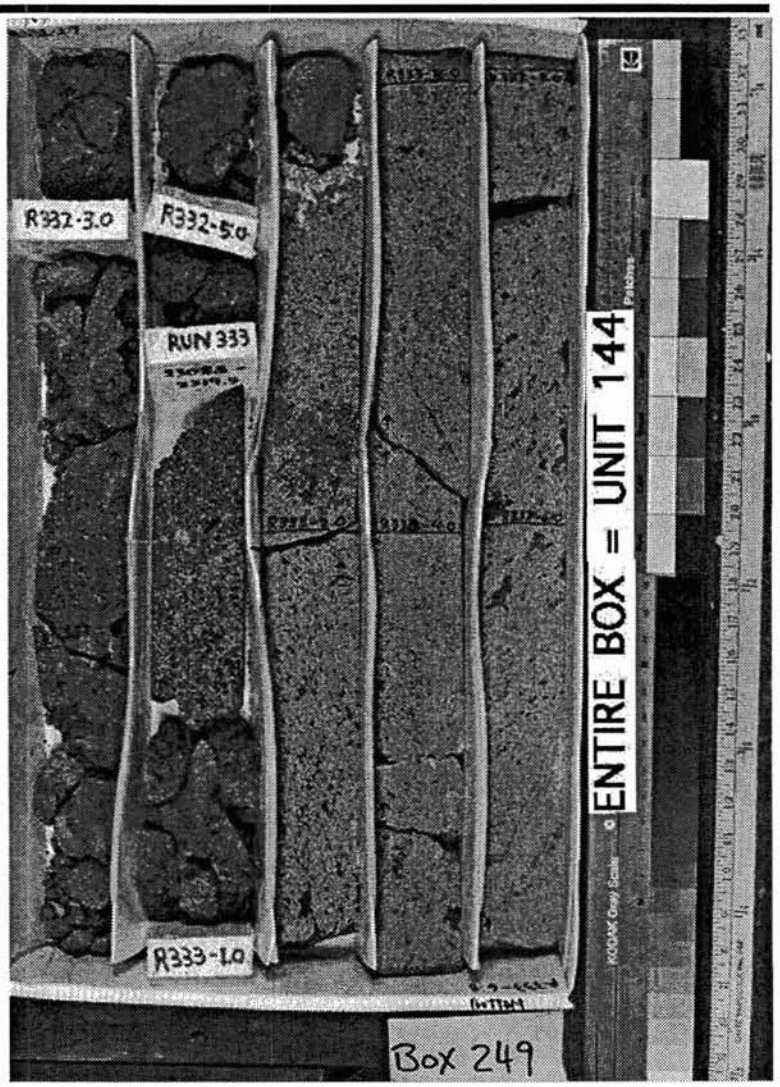
Driller's depth:top [feet]: 2309.2
Driller's depth:bottom [feet]: 2317.9
Core type: HQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:144

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-3 mm – equant to blocky –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-4 mm – sub-angular – inclined – variable %
Alteration: fresh (<2% altered) – clay on surfaces except in rubble at top
Veins: none
Fractures: weakly: 6/6 ft
Additional comments:
mild NaCl ppt around olivine



Box #: 250

Cores in box
333
334

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2317.9
Driller's depth:bottom [feet]: 2327.2
Core type: HQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

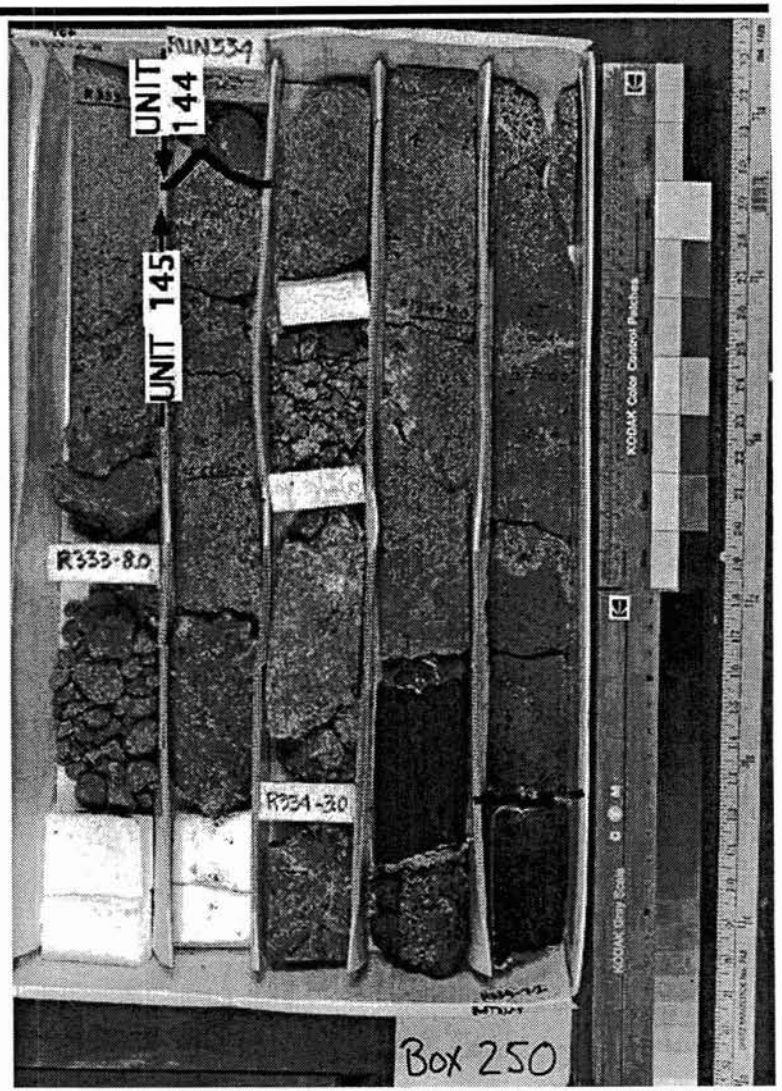
UNIT #: 144

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R334-0.2-**2319.7**')(flow contact)
base marked by red, oxidized zone
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-3 mm – equant –
100 pts counted at R333-7.3
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: <5% – <1-2 mm – sub-rounded – inclined –
Alteration: slightly (2-10% altered) –
oxidized
Veins: none
Fractures: weakly to rubbly at base
Additional comments:

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 145

Contacts: Top (ft): (R 334-0.2-**2319.7**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red baked rubbly top; internal contact at R334-6.9
Unit type: aa
aa at top; pahoehoe at base
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant –
100 pts counted at R334-4.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 med. gray – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-3 mm – spherical – equant –
variable bands of highly vesicular material
Alteration: slightly (2-10% altered) –
oxidized with clay in vesicles
Veins: none
Fractures: weakly: 7/2 ft to rubbly
Additional comments:



Box #: 251

Cores in box
334
335

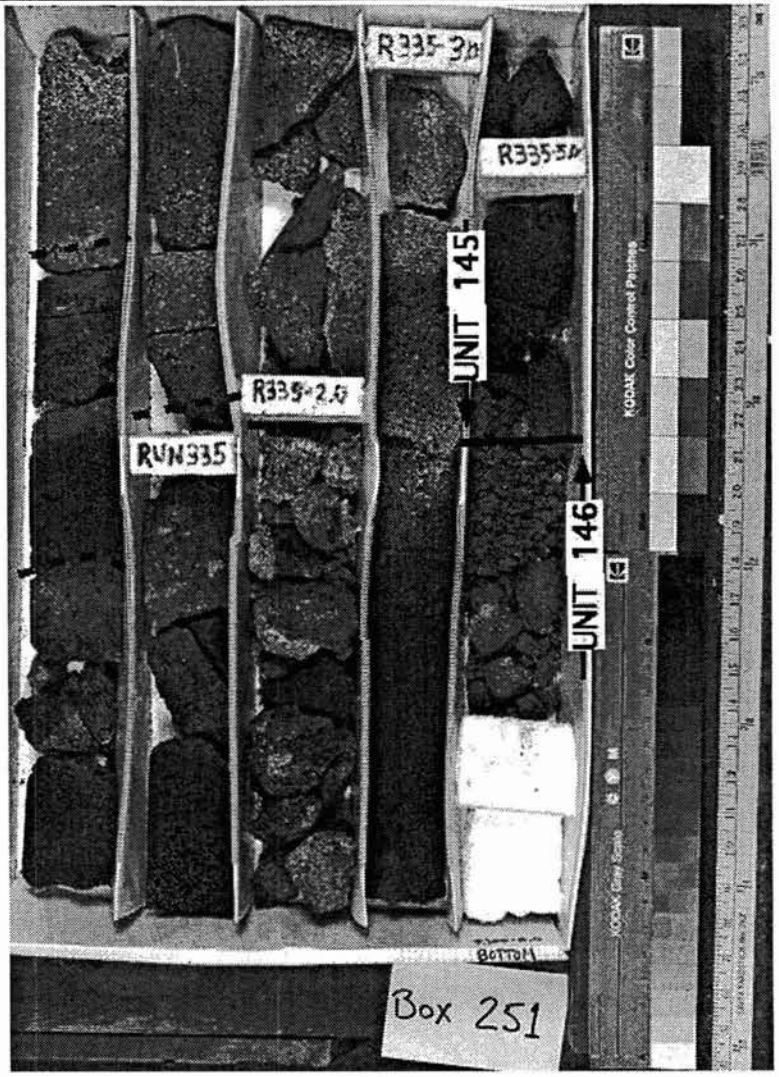
Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2327.2
Driller's depth:bottom [feet]: 2339.0
Core type: HQ

Units in box: 1

BOX UNIT 1: moderately to highly olivine phyric basalt **UNIT #:145**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R335-5.5-2335.1')(flow contact)
? on bottom contact; flow boundaries are unclear! numerous red zones with vesicularity change but no lithology change; unit 146 (below R335-5.5) is described in Box 252
Unit type: transitional
rubbly base
Phenocrysts/Clasts:
moderately to highly phyric (~10%) –
olivine – 8-12% – 1-3 mm – equant –
100 pts counted at R335-4.0; some large 0.5-0.8 cm grains
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 2/2 grayish red – **Structures:** – **Sorting:** –
Vesicles: >30% – <1-3 mm – spherical – equant–
Alteration: slightly (2-10% altered) –
oxidized
Veins: none
Fractures: weakly
Additional comments:
internal contacts at R334-7.9, 8.6, 9.3 and R335-2.0; autoliths common



Box #: 252

Cores in box: 336, 337, 338, 339

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2339.0
Driller's depth:bottom [feet]: 2356.4
Core type: HQ

Units in box: 2

BOX UNIT 1: moderately to highly olivine phyric basalt

UNIT #: 146

Contacts: Top (ft): (R335-5.5-2335.1')(flow contact)
Bottom (ft): (R337-0.0-2341.0')(flow contact)
~1/2' of this unit is present in Box 251
Unit type: massive
Phenocrysts/Clasts:
moderately to highly phyric (~10%) –
olivine – 8-12% – 1-3 mm – equant –
100 pts at R336-1.3
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-angular – horizontally elongated –
Alteration: slightly (2-10% altered) –
oxidized
Veins: none
Fractures: moderately (4/1 ft) to rubble
Additional comments:
cave material (green sand) from above; NaCl ppt

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 147

Contacts: Top (ft): (R337-0.0-2341.0')(flow contact)
Bottom (ft): (R--')(continuous with next flow)
flow top missing; internal contacts at R337-1.4 and 2.9 (red, vesicular zone)
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-12% – 1-4 mm – blocky (<3:1:1) –
100 pts at R339-1.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% to >30% – 1-5 mm – sub-angular – horizontally elongated –
Alteration: fresh to slightly (<2-10% altered) –
Veins: none
Fractures: moderately: 16/2 ft
Additional comments:
Olivines in this unit are larger than in the overlying unit.

Box #:	Cores in box
253	339 340

Loggers:	MG
Date logged:	11/29/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2356.4
Driller's depth:bottom [feet]:	2365.8
Core type:	NQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:147

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
internal flow contact at R339-4.3

Unit type: aa

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-3 mm – equant –
100 pts at R340-5.5
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 med. gray – **Structures:** – **Sorting:** –

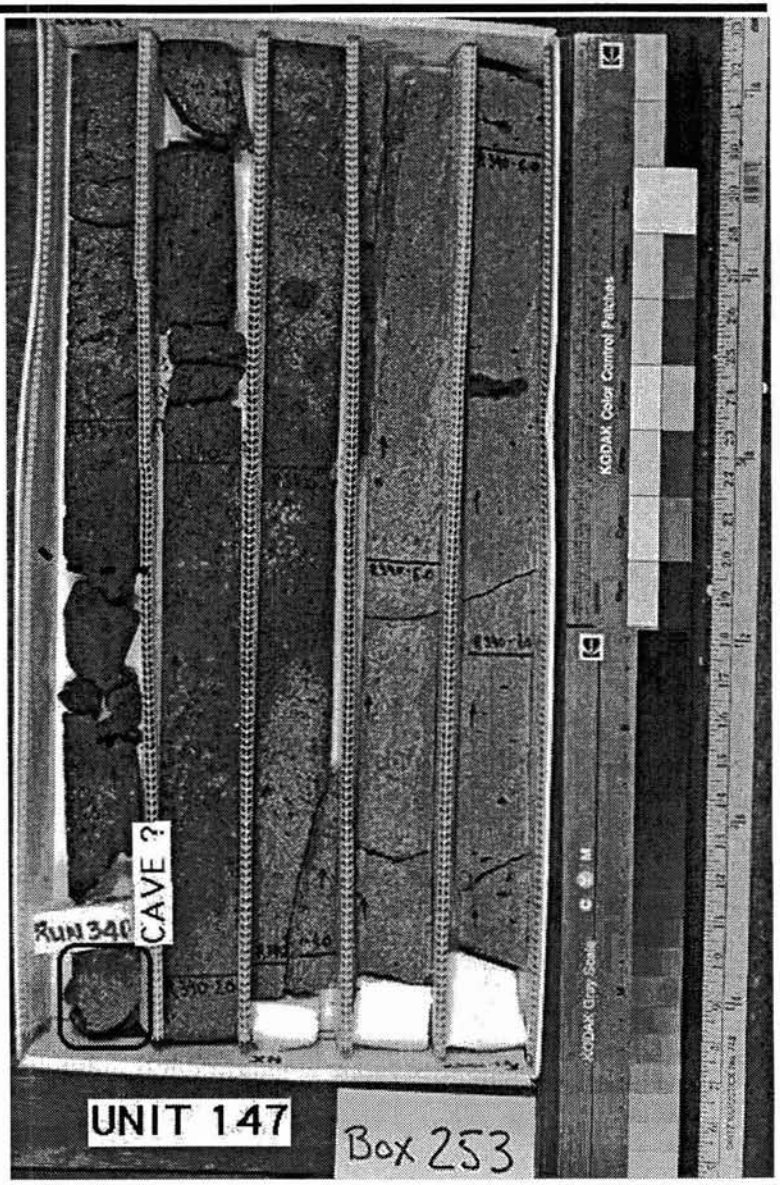
Vesicles: 10-20% – variable – sub-rounded – elongate –
highly variable but decreasing down section to <5% at R340-5.5

Alteration: fresh to moderately (<2 to 40% altered) –
oxidation

Veins: none

Fractures: weakly: 5/6 ft

Additional comments:
few pieces of cave material at top of run 340; autoliths in upper part of core (above R340-3.0)



Box #: 254

Cores in box
340
341

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2365.8
Driller's depth:bottom [feet]: 2374.3
Core type: NQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

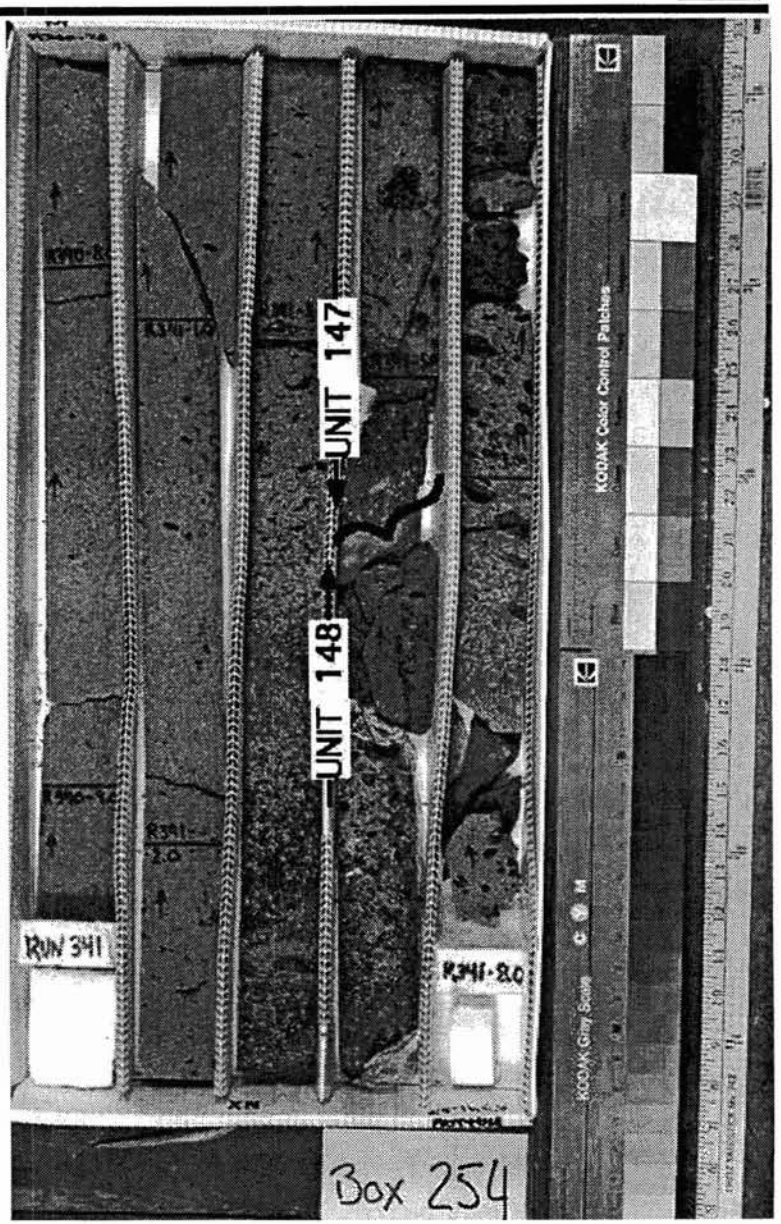
UNIT #: 147

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R341 - 5.2 - 2372.0')(flow contact)
red soil/ash at base, quenched base
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-4 mm – equant –
100 pts at R340-8.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-3 mm – sub-rounded – equant –
Alteration: fresh (<2% altered) –
except at base, which is oxidized
Veins: none
Fractures: weakly: 4/4 ft
Additional comments:
autoliths present near base

BOX UNIT 2: aphyric basalt

UNIT #: 148

Contacts: Top (ft): (R 341 - 5.2 - 2372.0')(flow contact)
Bottom (ft): (R --')(continuous with next box)
baked ash/soil at top
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – variable – spherical – horizontally elongated –
1-15 mm
Alteration: slightly to moderately (2-40% altered) –
Veins: none
Fractures: moderately: 9/2 ft
Additional comments:



Box #:	Cores in box
255	341 342

Loggers:	MG
Date logged:	11/29/93
Checked by:	MG
Check date:	12/13/93

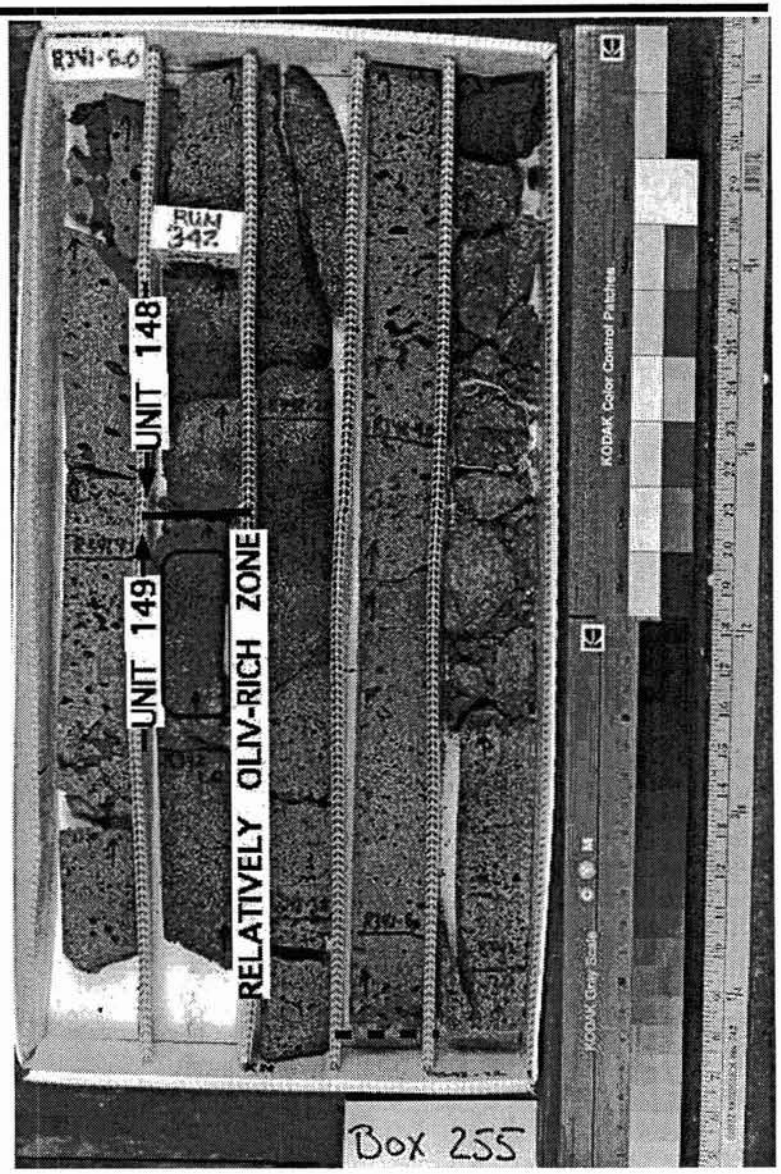
Driller's depth:top [feet]:	2374.3
Driller's depth:bottom [feet]:	2384.2
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 148

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R342-0.6-2377.1')(flow contact)
thin red zone; lithology change
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: 5YR 4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1 to 4 mm – spherical – equant –
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 6/3 ft
Additional comments:

BOX UNIT 2: sparsely to moderately olivine phyric basalt — UNIT #: 149

Contacts: Top (ft): (R 342-0.6-2377.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
sparsely to moderately phyric (1-10%) –
olivine – 1-3% – 1-2 mm – equant –
decreasing down section but irregularly
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) –
oxidized
Veins: none
Fractures: weakly: 6/4 ft to rubbly
Additional comments:
internal rubble zone at R342-6.0; no lithology change



Box #: 256

Cores in box: 342, 343

Loggers: MG
Date logged: 11/29/93
Checked by: MG
Check date: 12/13/93

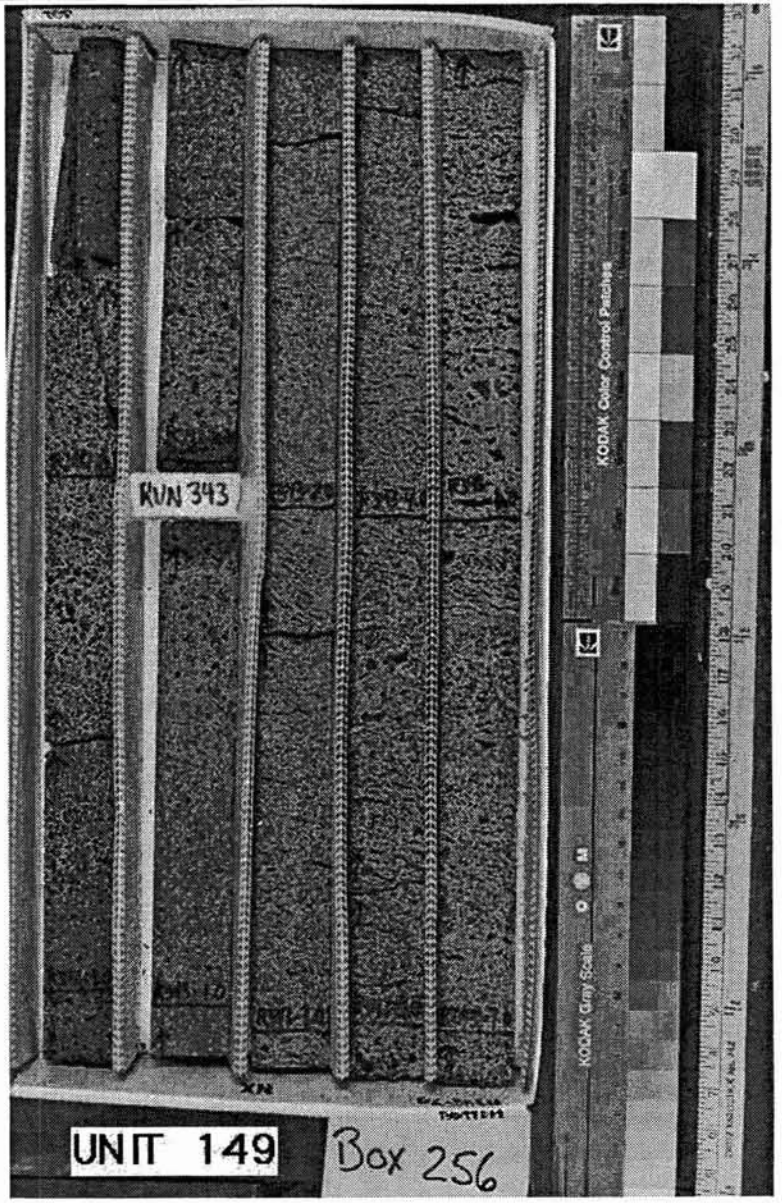
Driller's depth:top [feet]: 2384.2
Driller's depth:bottom [feet]: 2394.6
Core type: NQ

Units in box: 1

BOX UNIT 1: moderately to highly olivine phyric basalt

UNIT #:149

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately to highly phyric (~10%) –
olivine – 8-12% – 1-3 mm – equant –
variable %, increasing down section
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 6/10 ft
Additional comments:
NaCl ppt; beautiful rock



Box #:	Cores in box
257	343 344

Loggers:	MBB
Date logged:	12/1/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2394.6
Driller's depth:bottom [feet]:	2404.4
Core type:	NQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 149

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R344-5.2-**2402.2**')(flow contact)
flow contact defined by a lithologic change (less to more olivine) and a weathered/baked zone at the top of the bottom flow that grades into massive material by R344-6.0

Unit type: pahoehoe
classification based on high proportion of rounded vesicles distributed throughout the flow

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5% – 1-2 mm – equant –
5% at R343-7.7; olivines are moderately to very highly oxidized throughout the section
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –

Color: N3 dark gray – **Structures:** – **Sorting:** –

Vesicles: 10-30% – 1-4 mm – rounded – equant–
vesicle size is relatively constant throughout the section; vol.% oscillates throughout section (see photo)

Alteration: moderately (10-40% altered) –
groundmass oxidation; "B" = zones of increased clay(?) development

Veins: none

Fractures: weakly fractured: 21/7 ft; does not include rubbly zones labeled "A" on the photo

Additional comments:
minor NaCl ppt
see photo: "C" = possible internal flow contact

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 150

Contacts: Top (ft): (R 344-5.2-**2402.2**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
flow contact described in Unit 1

Unit type: transitional

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 18% – 2-5 mm – equant to tabular –
18% at R344-6.0
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium dark gray– **Structures:** – **Sorting:** –

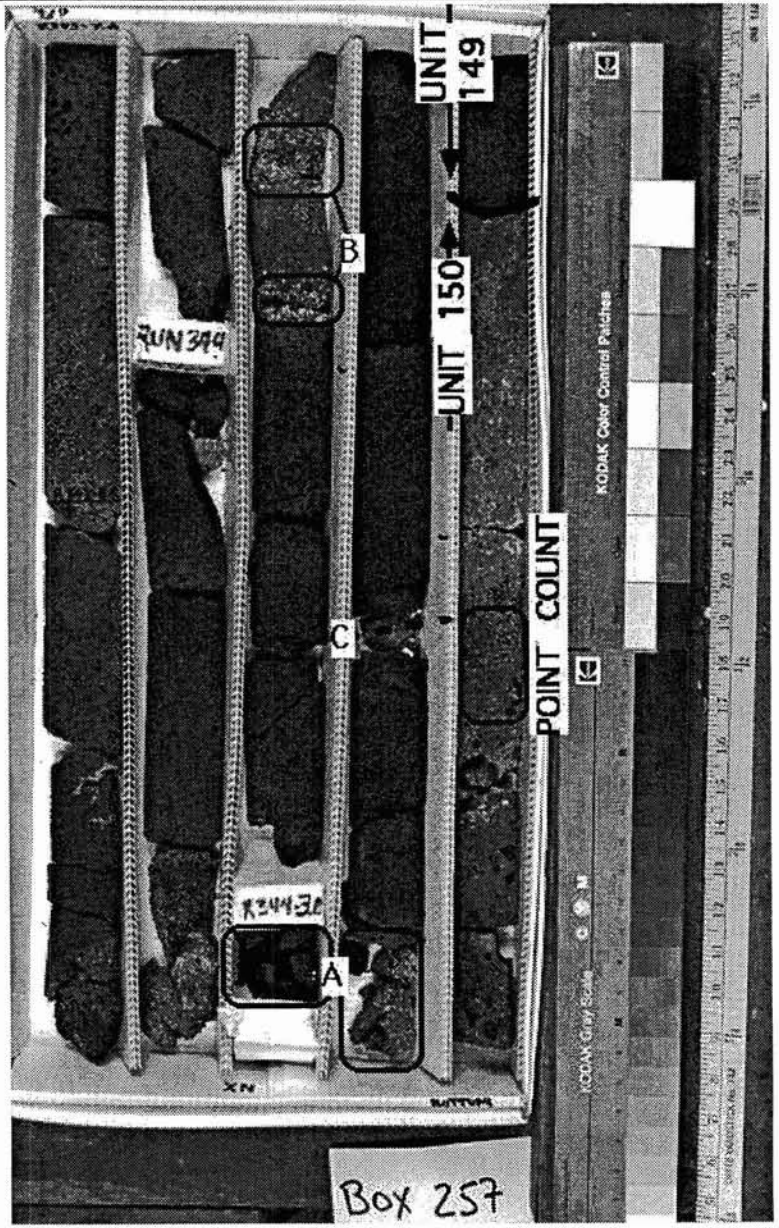
Vesicles: 5-20% – 1-5 mm – rounded to subrounded – equant–
size of vesicles and vesicle vol.% increase away from contact

Alteration: fresh to very highly (<2-95% altered) –
groundmass oxidation and weathering/clay development is highest in the interval R344-5.2 to R344-6.0 and decreases away from contact

Veins: none

Fractures: weakly fractured: 3/1.7 ft

Additional comments:
check for NaCl ppt on dry surfaces



Box #:	Cores in box
258	344 345 346

Loggers: GFE
Date logged: 12/1/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2404.4
Driller's depth:bottom [feet]: 2418.5
Core type: NQ

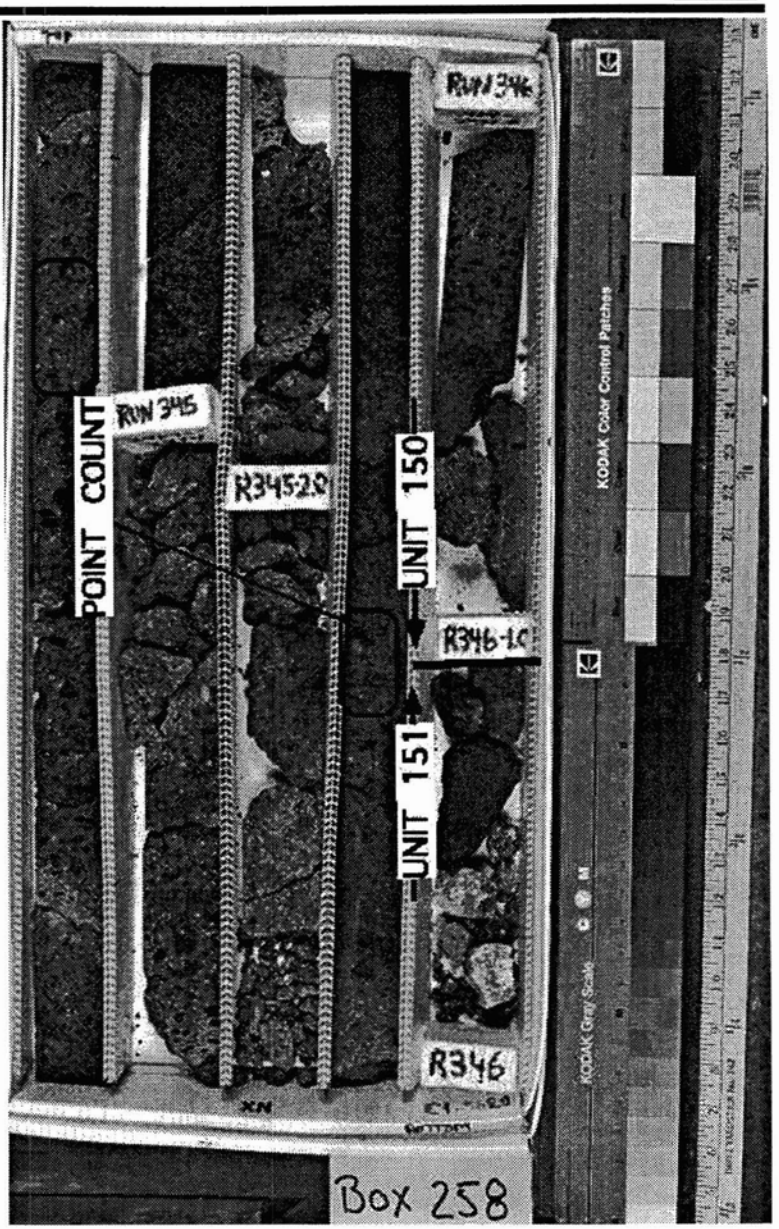
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 150

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R346-1.0-2412.8')(flow contact)
flow contact defined by slightly baked region and clinkery rubble
Unit type: massive
in region from R345-2.0 to R346-1.0, textures indicative of aa flow, i.e. angular, elongate sub vertical vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15% – 1-5 mm – blocky (<3:1:1) –
no obvious spinel inclusions inside the olivine; 100 points counted at R345-1.0
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-20% – 1-5 mm – sub-rounded to sub-angular – horizontally elongated –
vesicle distribution variable; >5 mm from R344-7.0 to 8.60, sub-vertical
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt at R345-4.8; autoliths between R344-9.0 and R345-3.0

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 151

Contacts: Top (ft): (R 346-1.0-2412.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
some clinkery rubble at top indicating aa flow
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-5 mm – blocky (<3:1:1) – iddingsite
olivine is highly altered making determination of inclusions difficult
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: 3/4 moderate brown – **Structures:** – **Sorting:** –
Vesicles: 20-30% – <1 mm – sub-rounded – equant –
Alteration: moderately (10-40% altered) – clay (?)
reddish/brown oxidation with some yellowish areas
Veins: none
Fractures: weakly fractured
Additional comments:



Box #: 259

Cores in box
346
347

Loggers: MBB
Date logged: 12/1/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2418.5
Driller's depth:bottom [feet]: 2428.2
Core type: NQ

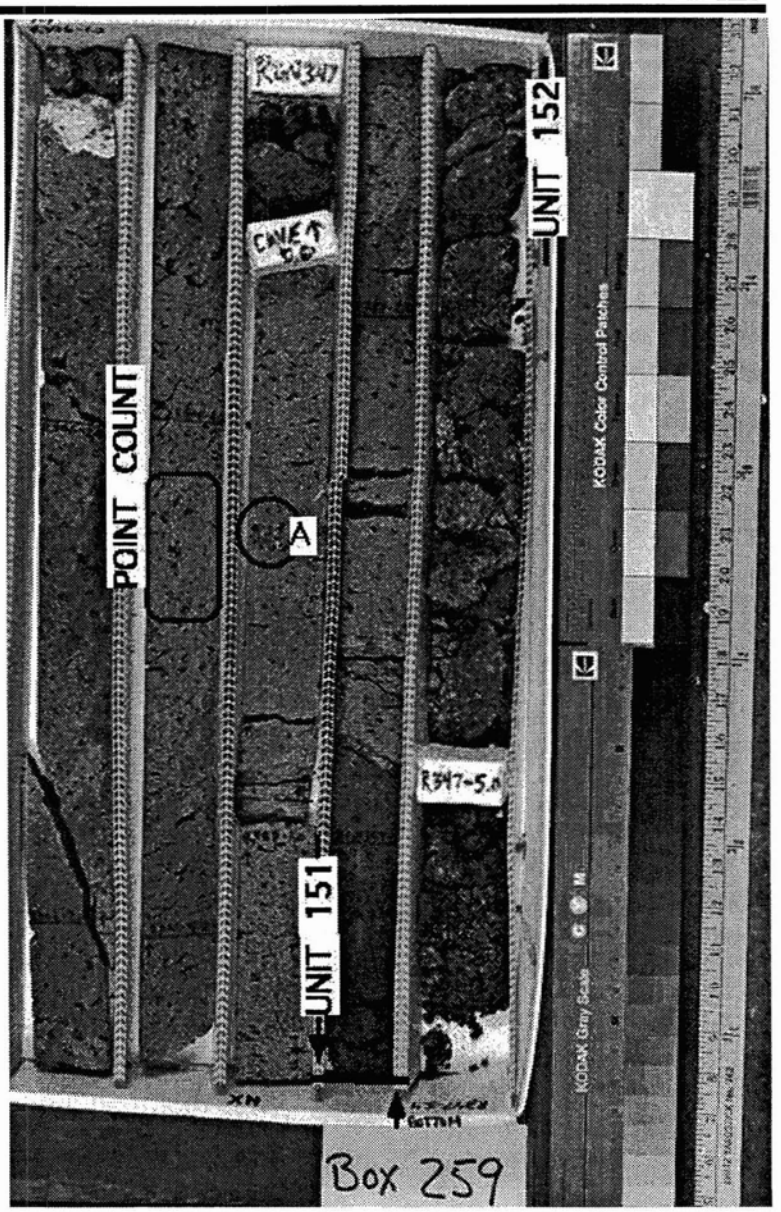
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 151

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R347-3.4-2420.5')(flow contact)
Flow contact defined by sharp transition from massive material (upper flow) to ~2' of rubbly clast-rich material (lower flow) that grades into massive material in box 260. No evidence of a baked zone.
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-5 mm – equant to tabular –
10% at R346-4.3; 20% at R347-2.5; olivine phenocrysts are inhomogeneously distributed; no obvious spinel inclusions; olivines are moderately oxidized/iddingsitized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1-5 mm – subrounded to angular – equant to horizontally elongate –
highly sheared vesicles in the interval R346-4.0 to R347-2.0 are up to 1 cm in length
Alteration: fresh to slightly (<2-10% altered) –
groundmass oxidation associated with small sheared vesicles; groundmass least oxidized in the interval R347-0.0 to R347-3.0
Veins: none
Fractures: weakly fractured: 8/7 ft; varying amounts of ivory-colored clay material coating some of the fracture surfaces
Additional comments:
see photo: "A" = microgabbroic inclusion

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 152

Contacts: Top (ft): (R 347-3.4-2420.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for contact description
Unit type: rubble
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to tabular –
visually estimated mode; olivine phenocrysts are completely oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 + 10R 4/6 – **Structures:** – **Sorting:** –
Vesicles: >5% – 1-5 mm – – –
Clasts are sufficiently small and extensively altered that vesicle description is difficult.
Alteration: highly to very highly (40-95% altered) –
groundmass oxidation; ivory-colored material (clay?) sprinkled over the rubbly pieces
Veins: none
Fractures: rubble
Additional comments:



Box #: 260

Cores in box
347
348

Loggers: MBB
Date logged: 12/2/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2428.2
Driller's depth:bottom [feet]: 2438.3
Core type: NQ

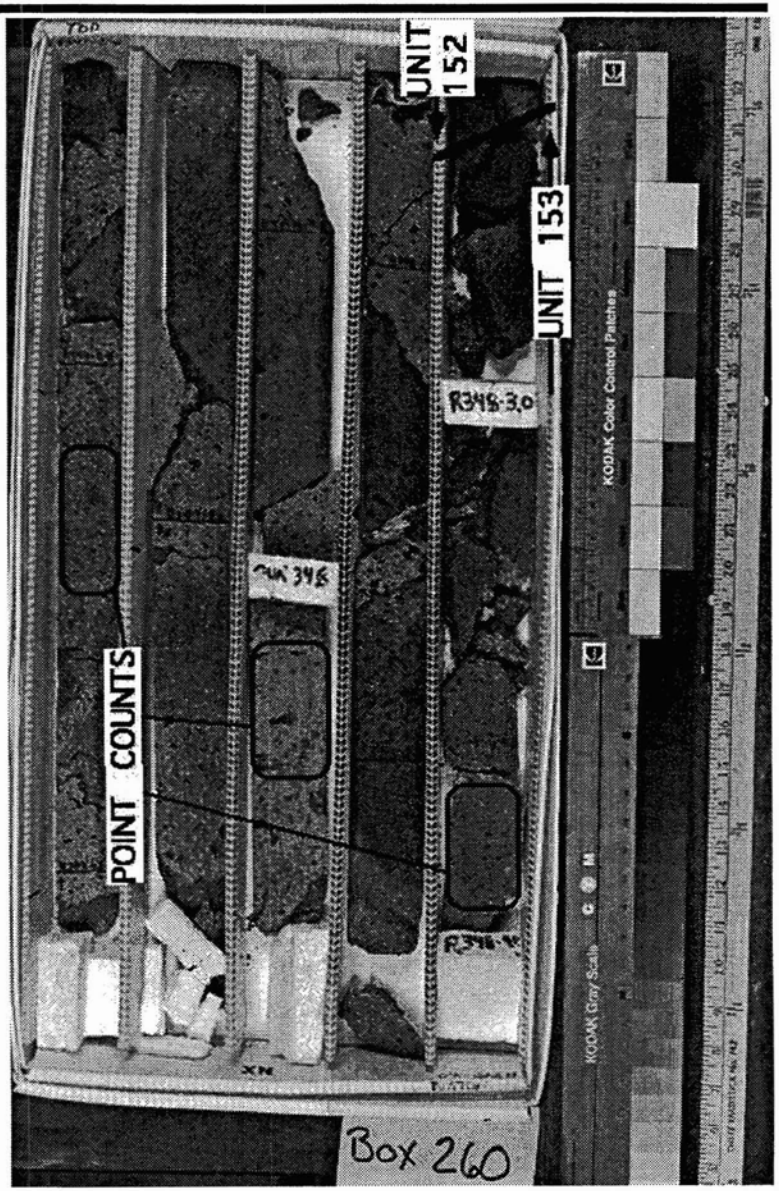
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 152

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R348-2.6-2435.1')(flow contact)
Flow contact defined by a red oxidized zone at the top of the bottom flow and a rapid decrease in vesicle size down toward the contact and clinkery material at the bottom of the top flow. There is also a lithologic change, a decrease in the abundance of olivine phenocrysts.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 14-16% – 2-4 mm – equant to tabular –
16% at R347-6.5; 14% at R348-0.2; no obvious spinel inclusions in the olivine phenocrysts; olivines are slightly to moderately oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1-5 mm – subrounded to subangular – equant to elongate –
vesicle size decreases toward contact
Alteration: fresh to moderately (<2-40% altered) –
extent of groundmass oxidation increases toward contact; freshest material in the interval between R347-5.5 and R347-9.5
Veins: none
Fractures: weakly fractured: 14/7 ft
Additional comments:

BOX UNIT 2: moderately plagioclase-olivine phyric basalt — UNIT #: 153

Contacts: Top (ft): (R 348-2.6-2435.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for a description of the contact
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 4% – ~1 mm – equant –
4% at R348-3.8; olivines are highly altered
plagioclase – <1% – ~1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 4/2 – **Structures:** – **Sorting:** –
Vesicles: 10-15% – 1-5 mm – subrounded to subangular – equant to elongate –
smaller vesicles are equant; larger vesicles are elongate
Alteration: highly (40-80% altered) –
extent of groundmass oxidation decreases away from contact
Veins: none
Fractures: moderately to weakly fractured - see photo
Additional comments:
minor NaCl ppt; plagioclase microphenocrysts; rare microgabbroic inclusions



Box #:	Cores in box
261	348 349

Loggers:	MBB
Date logged:	12/2/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2438.3
Driller's depth:bottom [feet]:	2448.1
Core type:	NQ
Units in box:	1

BOX UNIT 1: sparsely to moderately plagioclase-olivine phyric basalt **UNIT #:153**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
classification based on massive character of the core and the presence of sheared vesicles

Phenocrysts/Clasts:
sparsely to moderately phyric (1-10%) –
olivine – 1-4% – 1-3 mm – equant to tabular –
4% at R349-2.8; 2% at R349-7.8
plagioclase – <1% – ~1% – tabular (>3:1:1) –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium gray – **Structures:** – **Sorting:** –

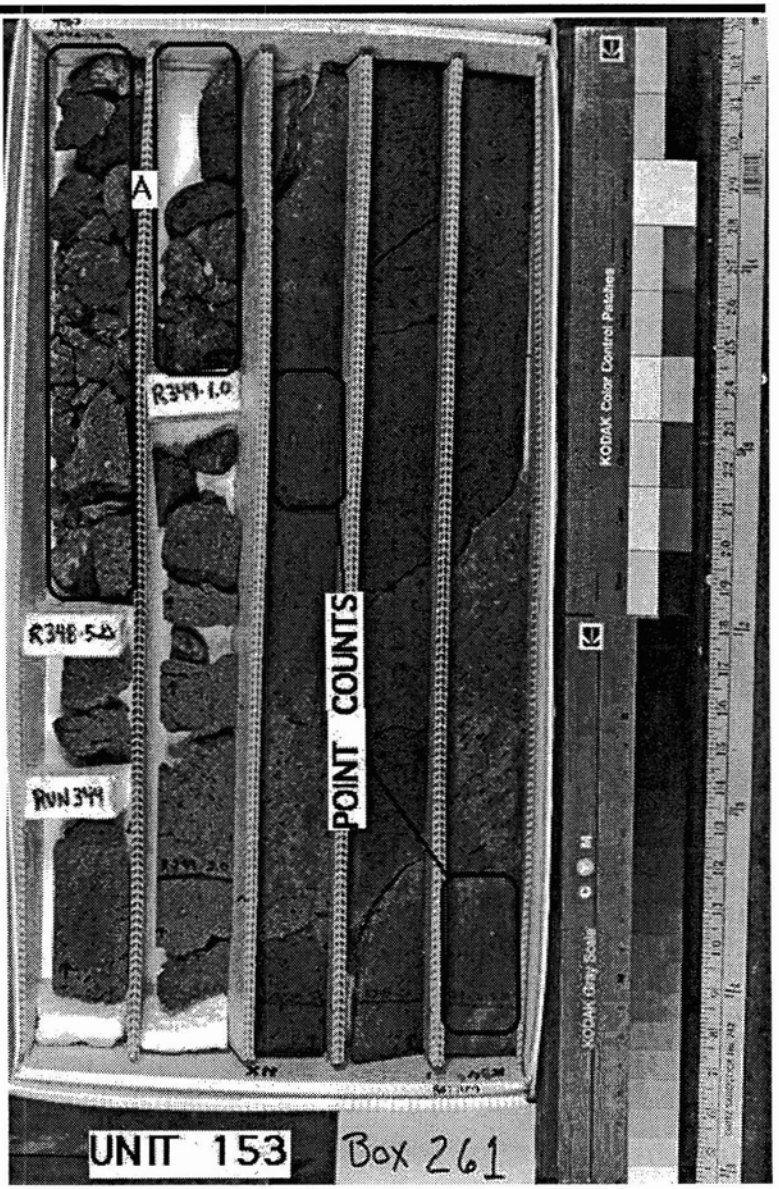
Vesicles: 1-10% – 1-5 mm – subrounded to angular – equant to elongate –
vesicle vol.% decreases dramatically below R349-7.6; elongate vesicles are horizontal to subhorizontal

Alteration: fresh to very highly (<2-95% altered) –
groundmass oxidation; core is essentially fresh by R349-1.0

Veins: none

Fractures: weakly fractured: 16/7.5 ft; fractures per foot decreases below R349-2.0; some ivory-colored material (clay?) partially coating some of the fractured surfaces

Additional comments:
minor NaCl ppt; <3 mm microgabbroic clots
see photo: "A" = rubbly zones



Box #: 262

Cores in box
349
350

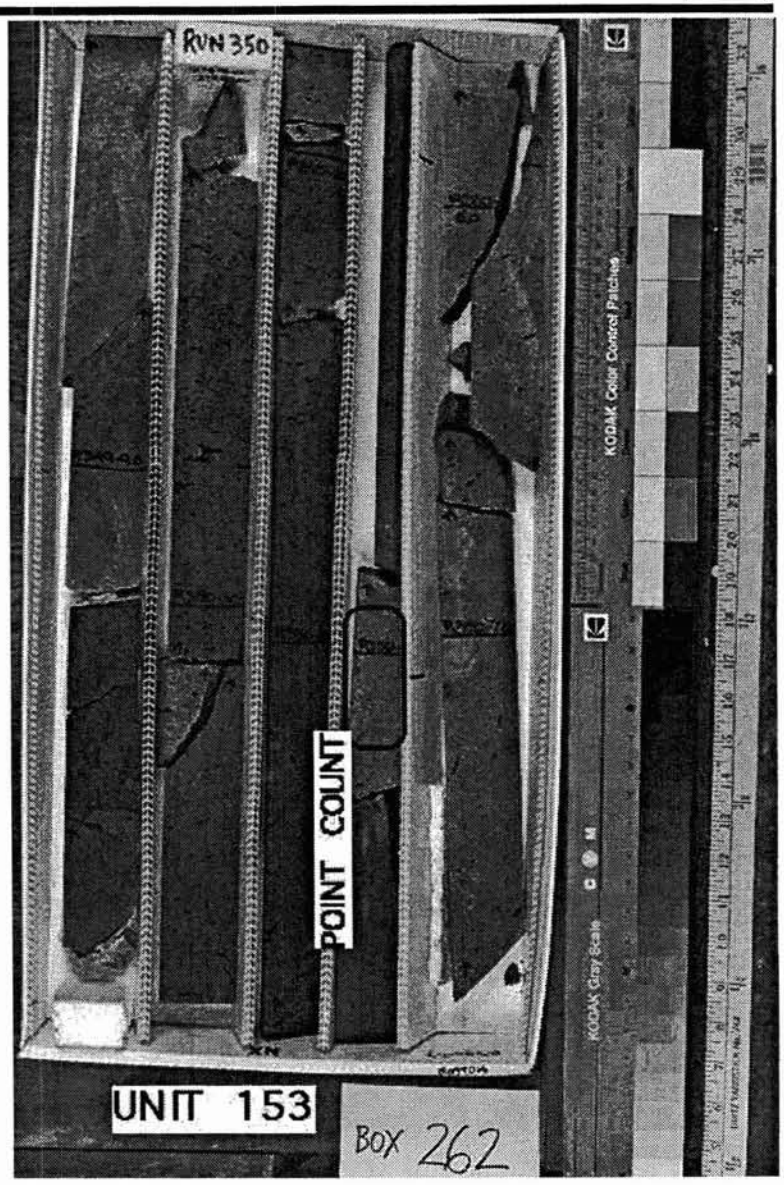
Loggers: GFE
Date logged: 12/4/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2448.1
Driller's depth:bottom [feet]: 2457.9
Core type: NQ

Units in box: 1

BOX UNIT 1: sparsely plagioclase-olivine phyric basalt **UNIT #:153**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Possible aa flow. Clinkery at some separation boundaries. Also sub-horizontal, elongated vesicles.
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1% – 1-3 mm – blocky (<3:1:1) –
plagioclase – ~1% – 1 mm – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: sparsely fractured
Additional comments:
rare open-textured microgabbroic inclusions



Box #: 263

Cores in box
350
351

Loggers: GFE
Date logged: 12/3/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2457.9
Driller's depth:bottom [feet]: 2468.3
Core type: NQ

Units in box: 2

BOX UNIT 1: sparsely plagioclase-olivine phyric basalt

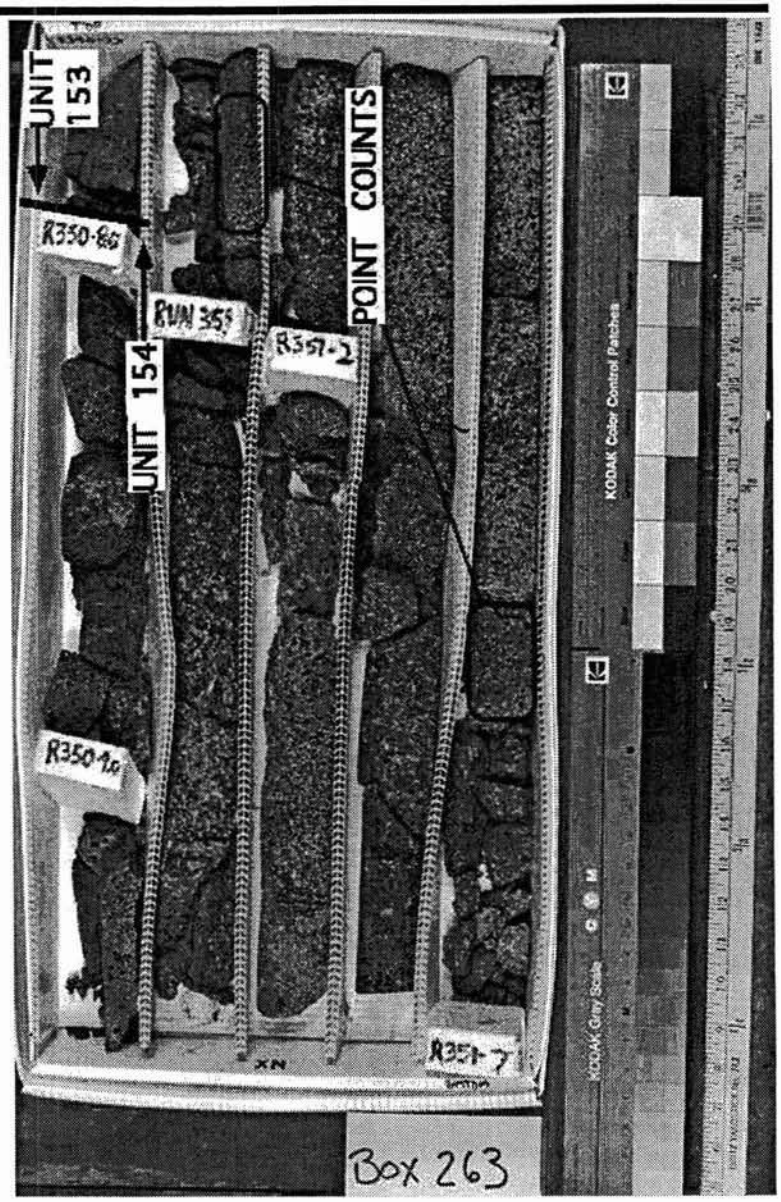
UNIT #: 153

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R350-8.0-2457.5')(flow contact)
Unit type:
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – ~1% – 1-3 mm – equant –
plagioclase – ~1% – ~1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures:
Additional comments:

BOX UNIT 2: sparsely olivine phyric basalt

UNIT #: 154

Contacts: Top (ft): (R 350-8.0-2457.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-5 mm – blocky (<3:1:1) –
100 pts counted
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – spherical – equant –
extremely vesicular; small, equant, round vesicles
Alteration: slightly to moderately (2-40% altered) –
alteration from R350-8.0 to R351-1.0
Veins: none
Fractures: sparsely fractured
Additional comments:
NaCl ppt



Box #:	Cores in box		Loggers:	LLW	Driller's depth:top [feet]:	2468.3
264	351	354	Date logged:	12/2/93	Driller's depth:bottom [feet]:	2484.4
	352		Checked by:	MG	Core type:	NQ
	353		Check date:	12/13/93	Units in box:	2

BOX UNIT 1: moderately to highly olivine phyric basalt — UNIT #: 154

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R352-1.8-2471.1')(flow contact)
flow contact defined by long rubble zone from R352-1.8 to R355-0.7 (see photo); note however similar lithologies of unit 1 and 2; glassy base

Unit type: massive

Phenocrysts/Clasts:
moderately to highly phyric (≥10%) –
olivine – 10-15% – 1-5 mm – equant – iddingsite
10% @ R352-0.3; no obvious spinel inclusions; olivines are moderately iddingsitized; 15% @ R352-0.6
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

Vesicles: 10-20% – 1-5 mm – sub-rounded to sub-angular – equant to elongate –
top of box has larger average vesicle size (~5 mm) grading to smaller at base of unit; zone "A" (on photo) contains only ~2% vesicles

Alteration: fresh to highly (<2-80% altered) –
grades from fresh at top of box to highest at base of unit; high begins at R352-6.4

Veins:

Fractures: weakly fractured: 10/3.8 ft; ivory colored, coatings along fractures (clays?)

Additional comments:
NaCl ppt

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 155

Contacts: Top (ft): (R 352-1.8-2471.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description

Unit type: aa
massive material with sheared vesicles plus rubble zone from R352-1.8 to R355-0.7

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-3 mm – equant to tabular – iddingsite
1% @ R355-1.4; no obvious spinel inclusions; moderate to highly iddingsitized
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium gray – **Structures:** – **Sorting:** –

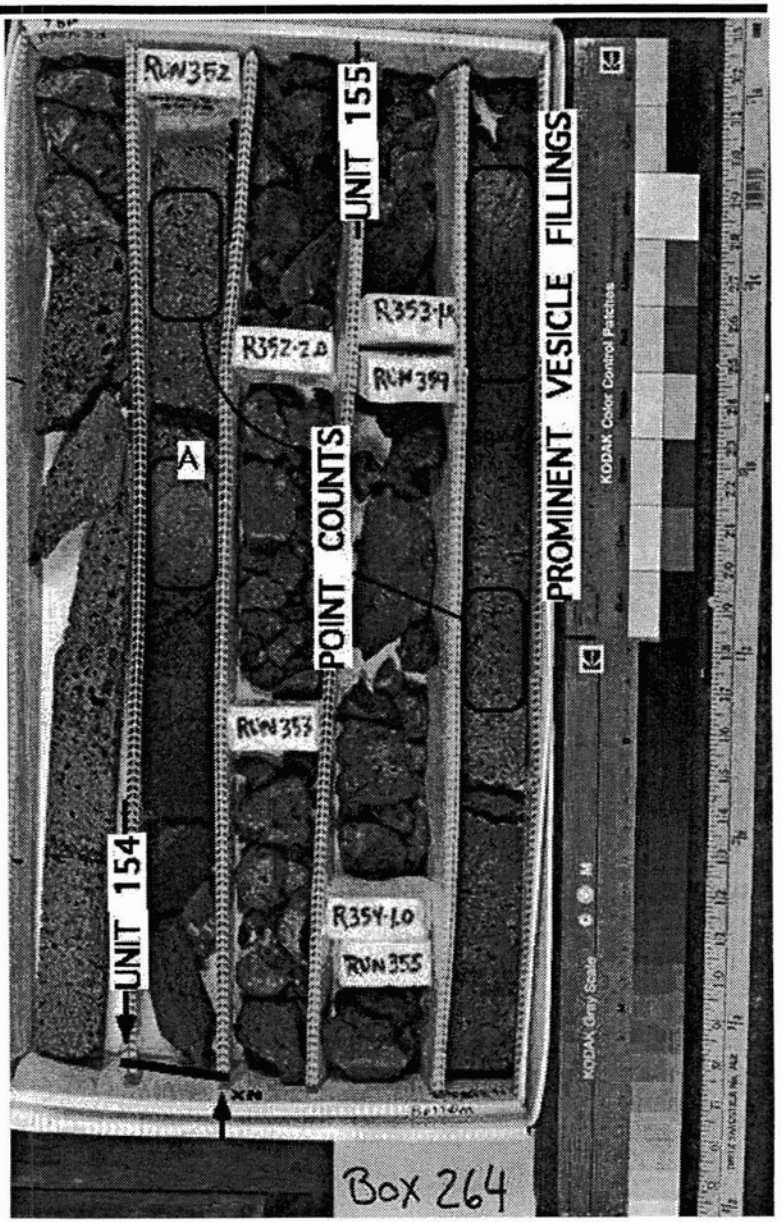
Vesicles: <5% – 1-5 mm – sub-angular – horizontally elongated –
oxidation
vesicle fillings decrease from top of flow downward

Alteration: fresh to highly (<2-80% altered) –
flow unit is fresh; rubble zone ranges from slightly to highly altered

Veins:

Fractures: weakly fractured: 3/1.8 ft; does not include rubbly zone from R352-1.8 to R355-0.7; ivory-colored (clay?) veinlets on fracture surfaces

Additional comments:



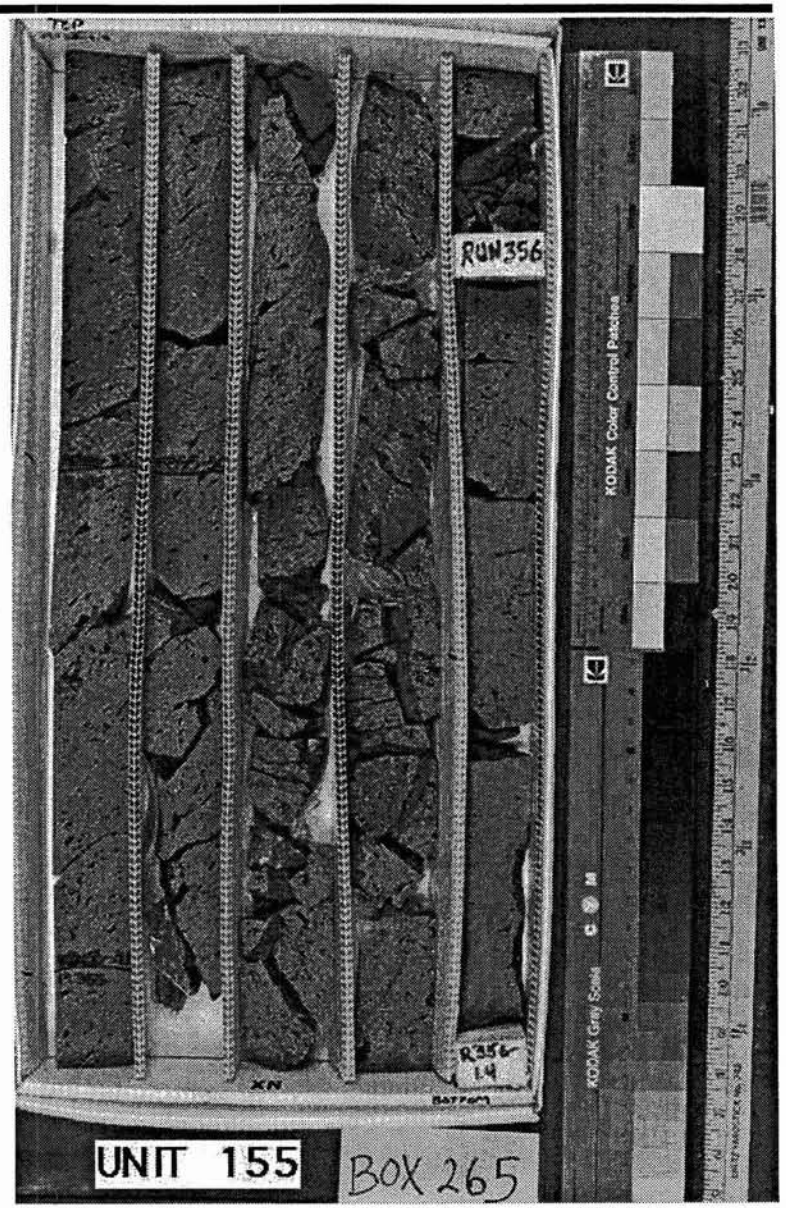
Box #:	Cores in box
265	355 356

Loggers:	MBB
Date logged:	12/2/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2484.2
Driller's depth:bottom [feet]:	2492.4
Core type:	NQ
Units in box:	1

BOX UNIT 1: sparsely olivine phyric basalt **UNIT #:155**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
massive material with highly sheared vesicles
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1% – 1-2 mm – equant to tabular –
mode estimated visually; no obvious spinel inclusions; slight to moderate oxidation of the olivine phenocrysts; large xenocrysts?
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 3-10% – 1-5 mm – subrounded to angular – equant to elongate –
orientation of the elongate vesicles varies from inclined to horizontal
Alteration: fresh to slightly (<2-10% altered) –
most of the groundmass oxidation associated with the highly sheared vesicle trains
Veins: none
Fractures: moderately fractured: 45/9.6 ft; hint of groundmass oxidation on some of the fractured surfaces; ivory/white-colored material (clay?) dusting some of the fractured surfaces
Additional comments:
minor NaCl ppt; <2 mm microgabbroic inclusions; rare plagioclase microphenocrysts



Box #: 266

Cores in box
356
357

Loggers: MBB
Date logged: 12/2/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2492.4
Driller's depth:bottom [feet]: 2505.7
Core type: NQ

Units in box: 2

BOX UNIT 1: sparsely olivine phyric basalt — UNIT #: 155

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R357-0.3-**2498.3**')(flow contact)
flow contact defined by lithologic change (increase in olivine abundance), differences in vesicularity; and red top to underlying flow

Unit type: aa
classification based on massive character of core and the presence of sheared vesicles

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-2 mm – equant –
1% at R356-6.4; no spinel inclusions observed; olivine phenocrysts are slightly oxidized
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N6 medium light gray – **Structures:** – **Sorting:** –

Vesicles: 1-3% – 1-5 mm – sub-angular – horizontally elongated –

Alteration: fresh (<2% altered) –

Veins: none

Fractures: weakly fractured: 13/5.7 ft

Additional comments:
microgabbroic inclusions; rare plagioclase microphenocrysts

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 156

Contacts: Top (ft): (R 357-0.3-**2498.3**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for contact description

Unit type: transitional
classification based on the presence of both equant and highly sheared vesicles

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 16% – 1-5 mm – equant to tabular –
16% at R357-1.6; no spinel inclusions observed in the olivines
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N6 medium light gray – **Structures:** – **Sorting:** –

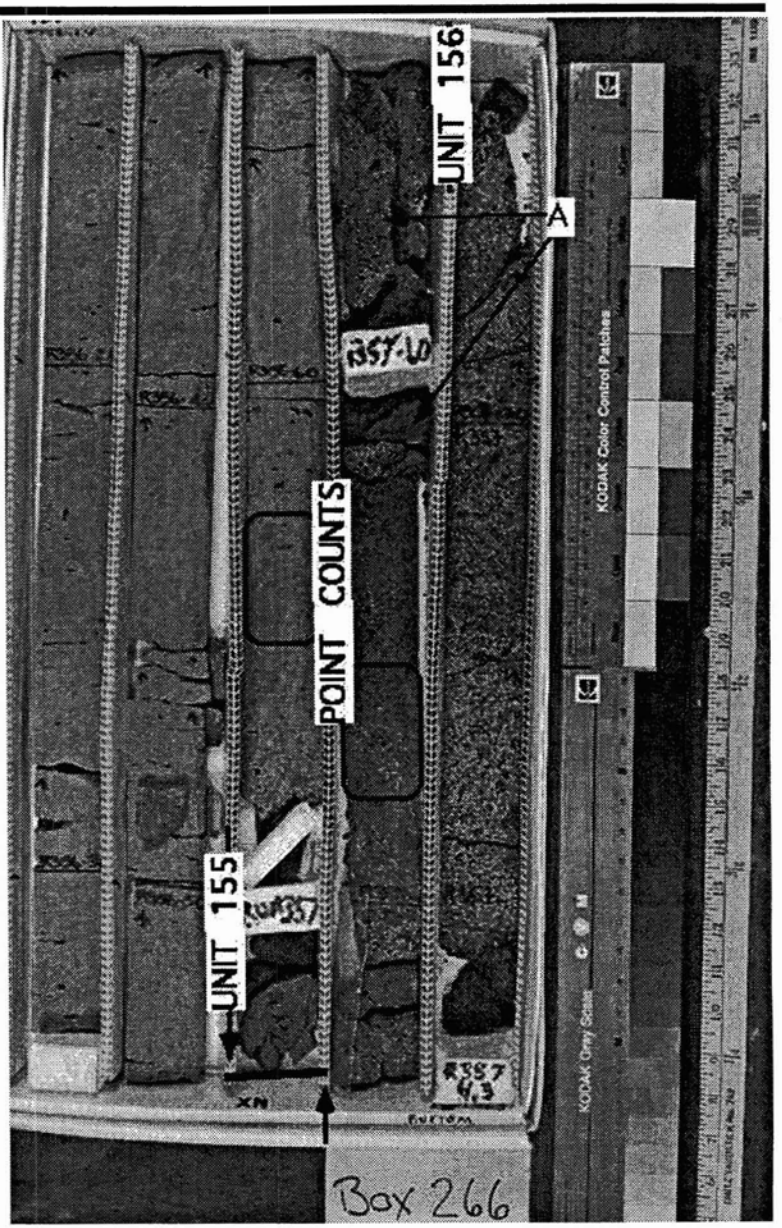
Vesicles: 10-20% – 1-5 mm – subrounded to subangular – equant to elongate –
smaller vesicles are equant; no preferred orientation to the elongate vesicles

Alteration: slightly to highly (2-80% altered) –
extent of groundmass oxidation decreases down section from contact; core becomes only slightly oxidized by R357-2.6

Veins: none

Fractures: weakly fractured: 9/3 ft; measurement doesn't include rubbly zones labeled "A" on the photo

Additional comments:



Box #:	Cores in box
267	357 358

Loggers:	MBB
Date logged:	12/2/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2505.7
Driller's depth:bottom [feet]:	2515.4
Core type:	NQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:156**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
possible internal contact at R357-4.3

Unit type: massive
unit may be transitional; core contains a mix of equant and sheared vesicles

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 20-22% – 2-5 mm – –
20% at R358-3.3; 22% at R358-8.7; no obvious spinels in olivine phenocrysts; olivines are highly to moderately oxidized, freshest olivines occur below R358-4.0
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium dark gray (fresh piece) – **Structures:** – **Sorting:** –

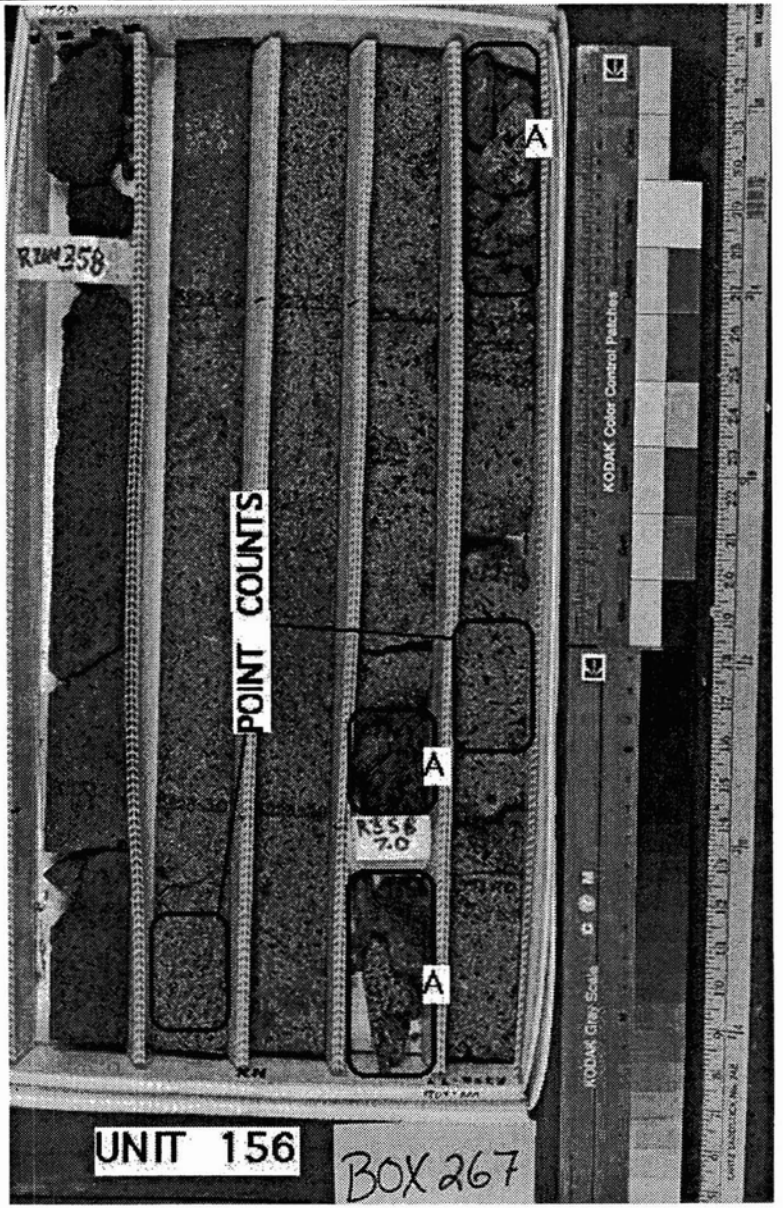
Vesicles: 10-25% – <1-5 mm – subrounded to subangular – equant to elongate –
no preferred orientation of the elongate vesicles; vesicle population includes a mixture of both small equant and larger elongate vesicles

Alteration: slightly to moderately (2-40% altered) –
extent of groundmass oxidation decreases over the interval R357-4.3 to R358-2.0.

Veins: none

Fractures: Weakly fractured: 9/8.6 ft; measurement doesn't include rubbly zones labeled "A" on the photo. Basalt exposed at the fractures is more highly oxidized.

Additional comments:
NaCl ppt; internal flow contact at R357-4.3; autoliths common



Box #:	Cores in box
268	358 359

Loggers:	LLW
Date logged:	12/3/93
Checked by:	MG
Check date:	12/13/93

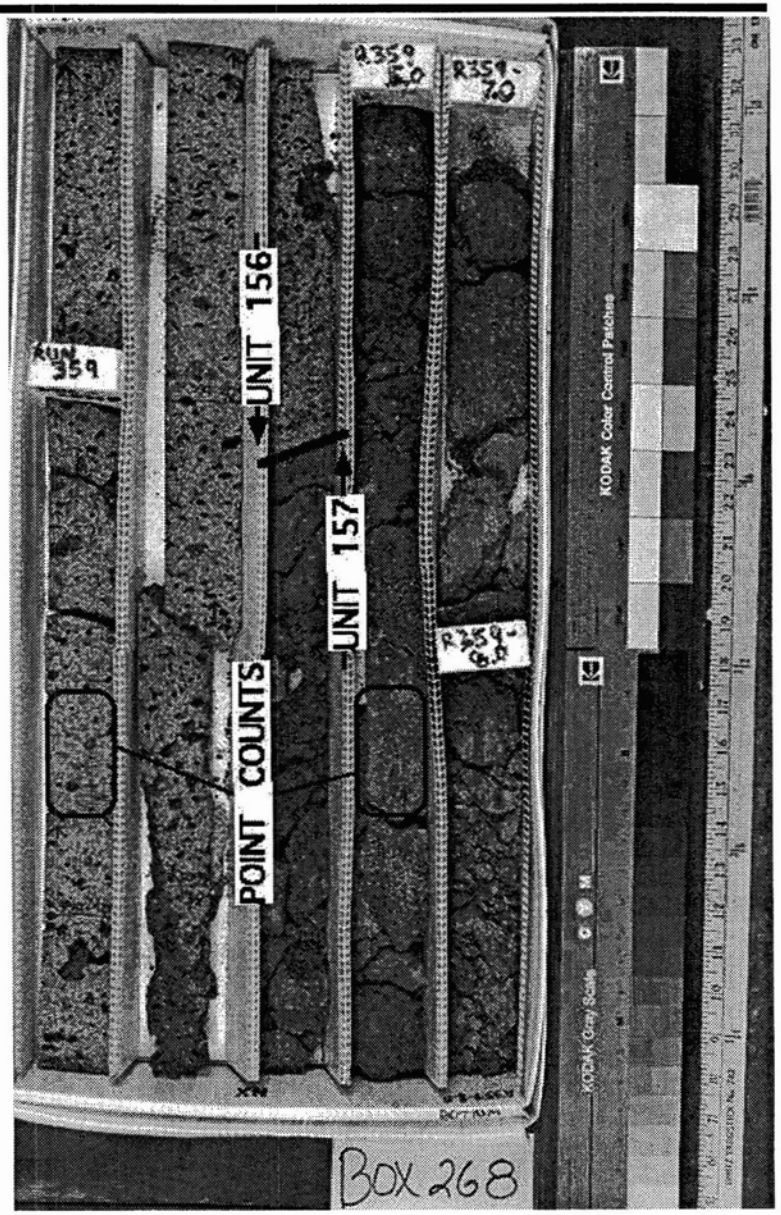
Driller's depth:top [feet]:	2515.4
Driller's depth:bottom [feet]:	2524.3
Core type:	NQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 156

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R359-4.2-**2520.2**')(flow contact)
flow contact defined by weathered red rubbly zone at top of unit 2 and lithologic change
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – iddingsite, oxidation
12% @ R359-0.7; olivine phenocrysts moderately altered; no obvious spinel inclusions
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 medium light gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 2-7 mm – rounded to sub-rounded – equant –
oxidation; rusty weathering product
rare vesicles >1 cm
Alteration: slightly (2-10% altered) –
oxidation to reddish alteration
Veins: none
Fractures: weakly fractured: 7/4.8 ft; oxidation coating on fracture surfaces
Additional comments:
NaCl ppt near bottom of flow

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 157

Contacts: Top (ft): (R 359-4.2-**2520.2**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for top contact description.
Unit type: massive
massive - highly rubbly (see photo)
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-3 mm – equant to tabular – iddingsite, oxidation
visual estimate
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded to sub-angular – equant –
white clay, red oxidation
Alteration: slightly to highly (2-80% altered) –
highly altered at top of unit (R359-4.4); rest of unit slightly altered
Veins: none
Fractures: highly fractured/rubble (see photo)
Additional comments:
NaCl ppt



Box #:	Cores in box
269	359 360

Loggers: LLW
Date logged: 12/3/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2524.3
Driller's depth:bottom [feet]: 2534.5
Core type: NQ

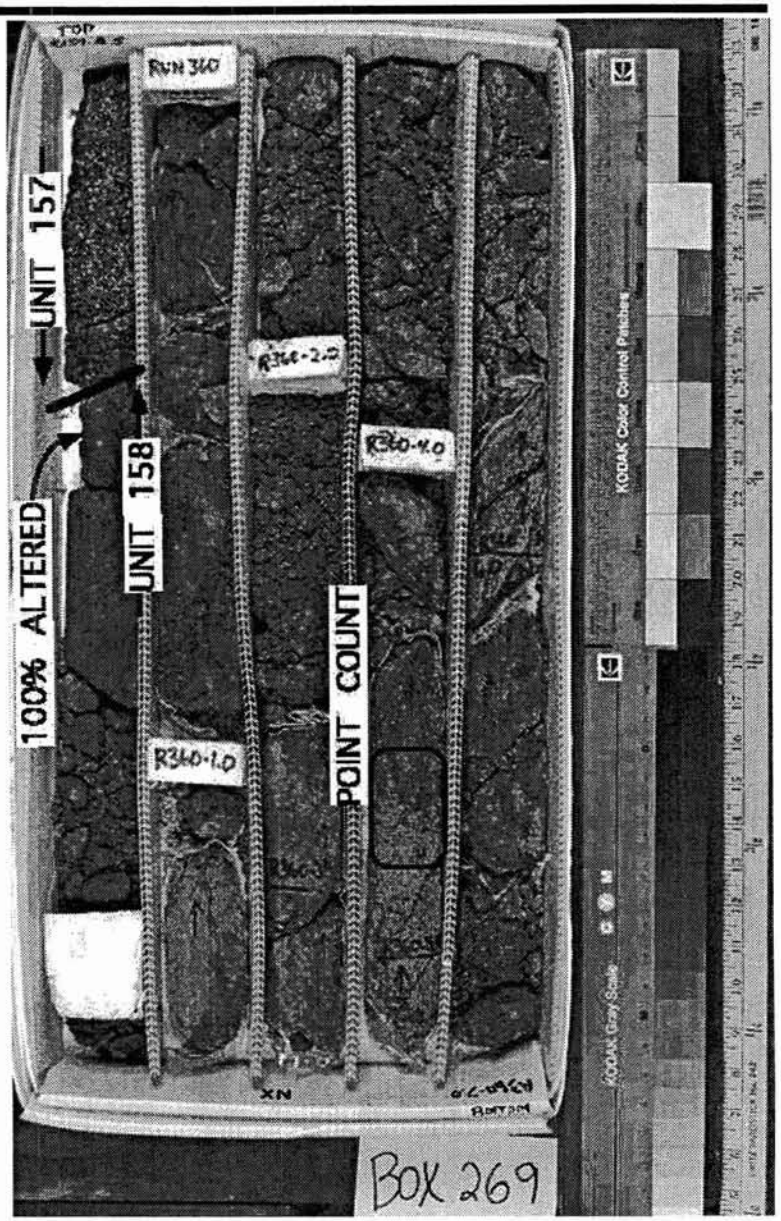
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt **UNIT #: 157**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R359-9.1-2525.1')(flow contact)
flow contact defined by red baked zone
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-3 mm – equant – iddingsite
11% @ R360-4.7
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – equant –
oxidation
only occasional vesicle oxidation; increases towards contact at R359-9.1
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly fractured: 1/0.7 ft; white clays coat fractures; phenocrysts highly altered along fracture
Additional comments:

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 158**

Contacts: Top (ft): (R 359-9.1-2525.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: aa
highly rubbly top of an aa flow
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – iddingsite, oxidation
11% @ R360-4.7; olivine slightly iddingsitized below baked zone, highly oxidized and iddingsitized in baked zone
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R3 dark reddish brown to N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – ~1 mm – sub-angular – vertically elongated –
Alteration: slightly to completely (2-100% altered) –
baked zone at flow top completely altered, steady gradation into slightly altered by R360-4.4
Veins: none
Fractures: heavily fractured to rubbly (see photo)
Additional comments:
grades from reddish brown at top of flow to medium gray by R360-4.0



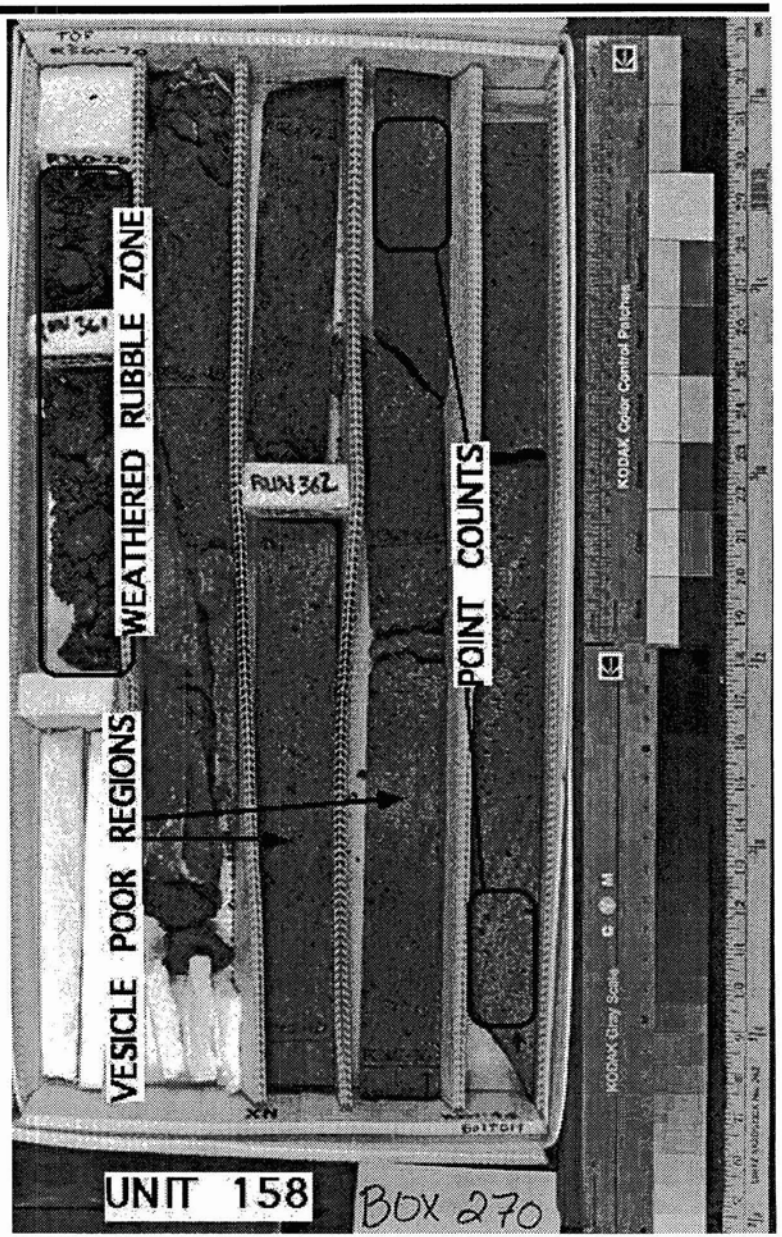
Box #:	Cores in box
270	360 361 362

Loggers:	GFE
Date logged:	12/3/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2534.5
Driller's depth:bottom [feet]:	2550.6
Core type:	NQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:158**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
There is a clinkery rubble zone that implies that the flow could be an aa flow. Also, elongate horizontal vesicles.
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-5 mm – blocky (<3:1:1) –
100 pts counted at R362-2.5 rare large (1 cm) crystals
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-angular – horizontally elongated–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 3/4 ft
Additional comments:



Box #:	Cores in box
271	362 365 363 364

Loggers: GFE
Date logged: 12/3/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2550.6
Driller's depth:bottom [feet]: 2566.3
Core type: NQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

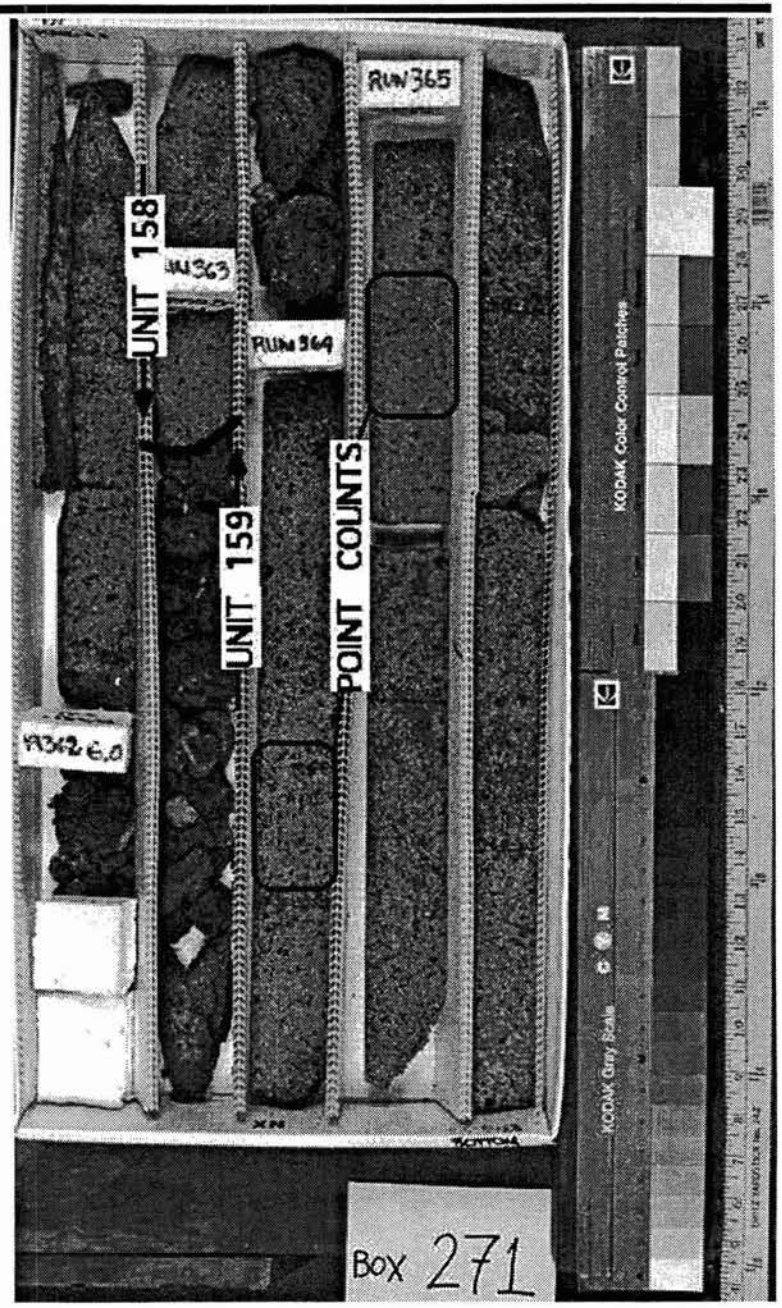
UNIT #: 158

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R363-0.3-2551.0')(flow contact)
red baked rubble zone
Unit type: massive
probably an aa flow, angular elongate vesicles and clinkery rubble
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-5 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – angular – horizontally elongated–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 1/1 ft
Additional comments:
From R363-0.3 to R363-2.0, there is an altered contact consisting of reddish brown clinkery rubble.
Vesicles very sparse, but become a little more numerous in patches randomly in core.

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 159

Contacts: Top (ft): (R 363-0.3-2551.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 14-16% – 1-3 mm – equant to blocky –
100 pts counted at R365-0.3
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-30mm – sub-angular – horizontally elongated–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 5/5 ft
Additional comments:



Box #: 272

Cores in box
365
366

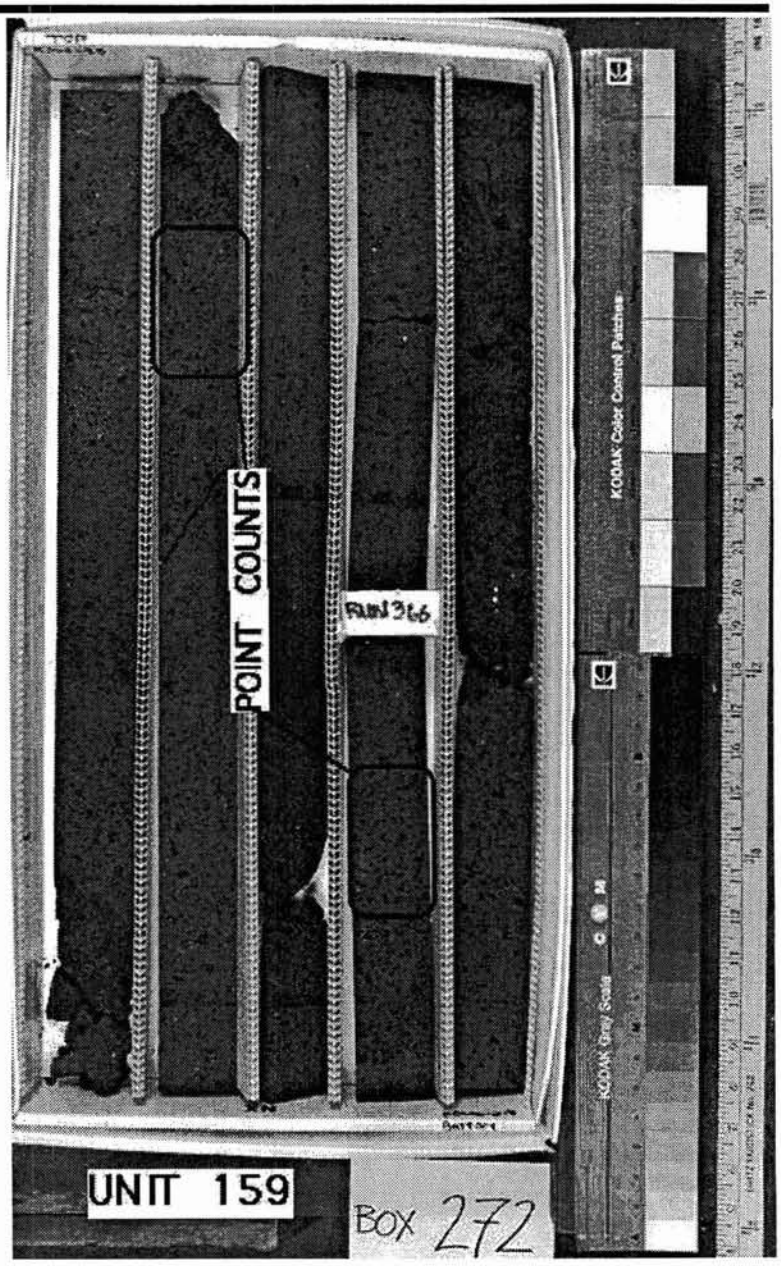
Loggers: MBB
Date logged: 12/3/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2566.3
Driller's depth:bottom [feet]: 2579.9
Core type: NQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:159**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
aa/transitional - core is not highly vesicular, although there is no evidence of sheared vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 14-16% – 2-5 mm – –
14% at R365-5.6; 16% at R366-0.5; olivines are moderately to highly oxidized, some iddingsite
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: 3-10% – <1-5 mm – subrounded to angular – equant to elongate –
elongate vesicles have no preferred orientation
Alteration: slightly to moderately (2-40% altered) –
groundmass oxidation localized around the vesicles, especially the <1 mm size fraction
Veins: none
Fractures: weakly fractured: 5/9.7 ft; fractured surfaces are slightly more oxidized than the basalt exposed on the slabbed surface
Additional comments:
NaCl ppt



Box #:	Cores in box
273	366 367

Loggers:	LLW
Date logged:	12/3/93
Checked by:	MG
Check date:	12/13/93

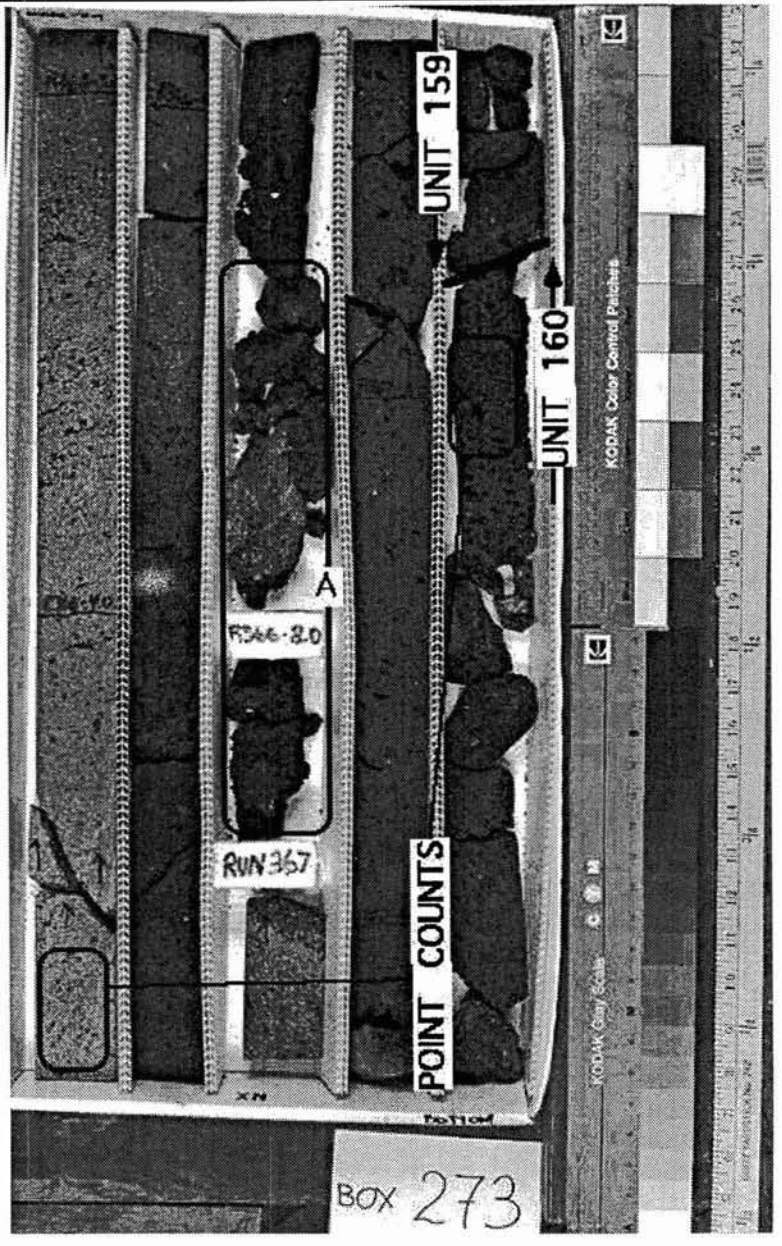
Driller's depth:top [feet]:	2579.9
Driller's depth:bottom [feet]:	2591.0
Core type:	NQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 159

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R367-2.6-2585.6')(flow contact)
contact defined by lithologic vesicularity change, and glass
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to tabular –
16% @ R366-4.8; very fresh; spinel inclusions in olivine
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 medium light gray to N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded to sub-angular – horizontally elongated –
Alteration: fresh to moderately (<2-40% altered) –
fresh at top of box, moderately altered at R366-5.8 through rubbly zone, back to fresh at R367-0.1
Veins: none
Fractures: weakly fractured: 7/4.5 ft; not including rubbly zone marked "A" in photo
Additional comments:
Flow contains rubbly zone from R366-7.3 to R367-0.0 (marked "A" on photo), but core on either side is similar so it has been mapped as a single unit. N6 grading into N4 above rubbly zone "A" on photo

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 160

Contacts: Top (ft): (R 367-2.6-2585.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: pahoehoe
unit type defined by large sub-rounded vesicles at top of unit
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – iddingsite, oxidation
11% @ R367-2.8; moderately altered
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR2 dusky brown – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-7 mm – sub-rounded – equant –
occasional red clays
occasionally horizontally elongate, especially near top of unit
Alteration: very highly (80-95% altered) –
matrix altered to red oxidized material
Veins: none
Fractures: moderately fractured: 9/1.7 ft; light colored to rusty (clay?) coatings on some fracture surfaces
Additional comments:



Box #: 274

Cores in box: 368

Loggers: GFE, MG
Date logged: 12-03-93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2591.0
Driller's depth:bottom [feet]: 2601.0
Core type: NQ

Units in box: 3

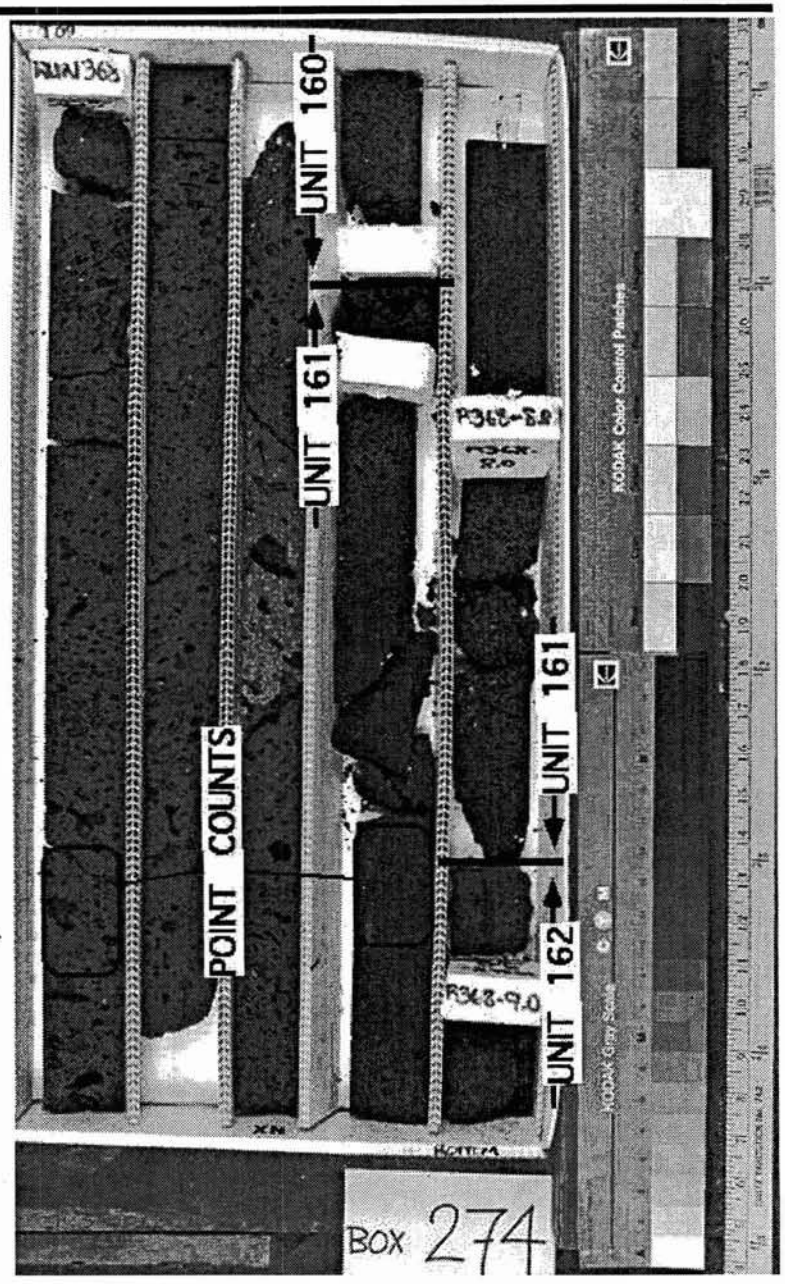
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 160

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R368-5.7-2596.7')(flow contact)
Even though there is a very weathered layer, lower unit does not appear very baked.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 14-16% – 1-5 mm – blocky (<3:1:1) –
100 pts counted at R368-1.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – horizontally elongated–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 7/6 ft
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 161

Contacts: Top (ft): (R 368-5.7-2596.7')(flow contact)
Bottom (ft): (R368-8.8-2599.8')(flow contact)
top and bottom marked by rubble zone
Unit type: massive
Small equant vesicles implying possible pahoehoe flow.
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-12% – 1-5 mm – blocky (<3:1:1) –
100 pts counted at R368-7.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dark gray– **Structures:** – **Sorting:** –
Vesicles: 5-10% – >5 mm – sub-rounded – equant–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 5/4 ft
Additional comments:
NaCl ppt

BOX 274 CONTINUED ON NEXT PAGE



Box #: 274

Cores in box: 368

Loggers: GFE
Date logged: 12-03-93
Checked by: MG
Check date: 12/13/93

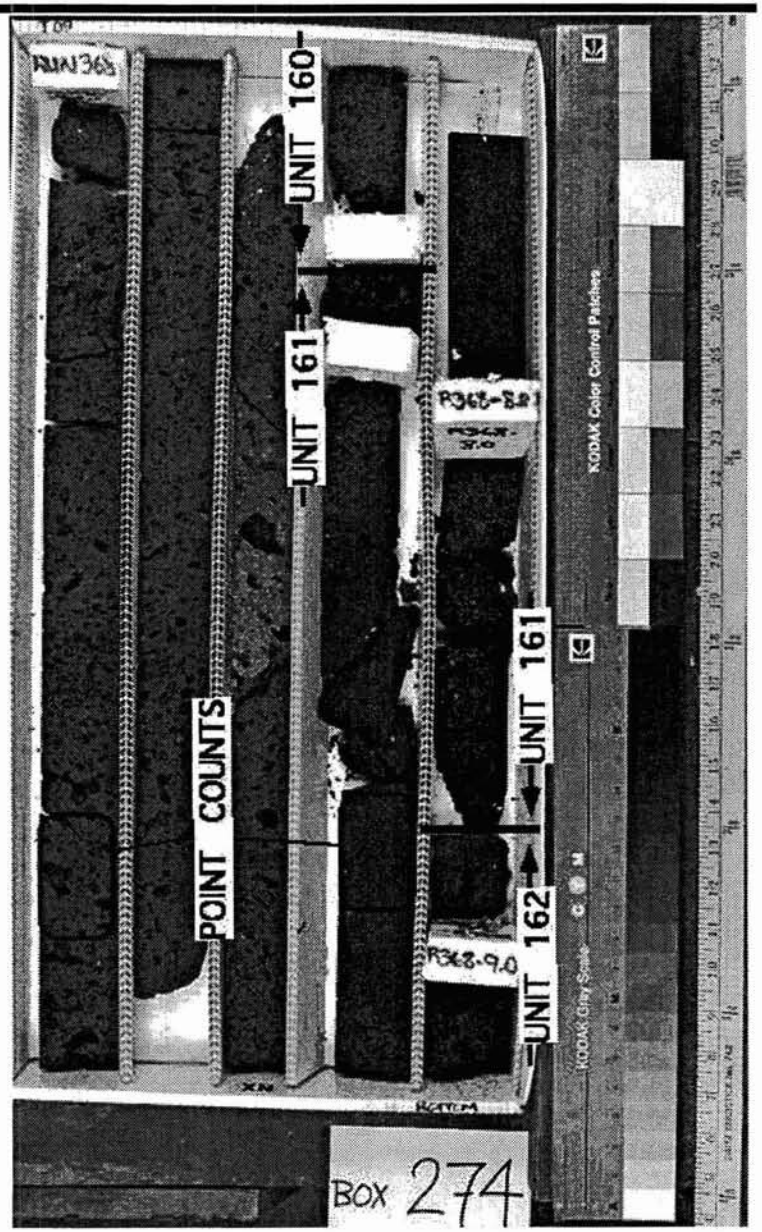
Driller's depth:top [feet]: 2591.0
Driller's depth:bottom [feet]: 2601.0
Core type: NQ

Units in box: 3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 162

Contacts: Top (ft): (R 368-8.8-2599.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Possible pahoehoe flow after very weathered soil-like contact.
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-5 mm – blocky (<3:1:1) –
visual estimate
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 2/2 reddish brown– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant–
Alteration: moderately to highly (10-80% altered) –
Veins: none
Fractures: sparsely fractured
Additional comments:



Box #: 275

Cores in box
369
370

Loggers: MBB
Date logged: 12/3/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2601.0
Driller's depth:bottom [feet]: 2619.3
Core type: NQ

Units in box: 3

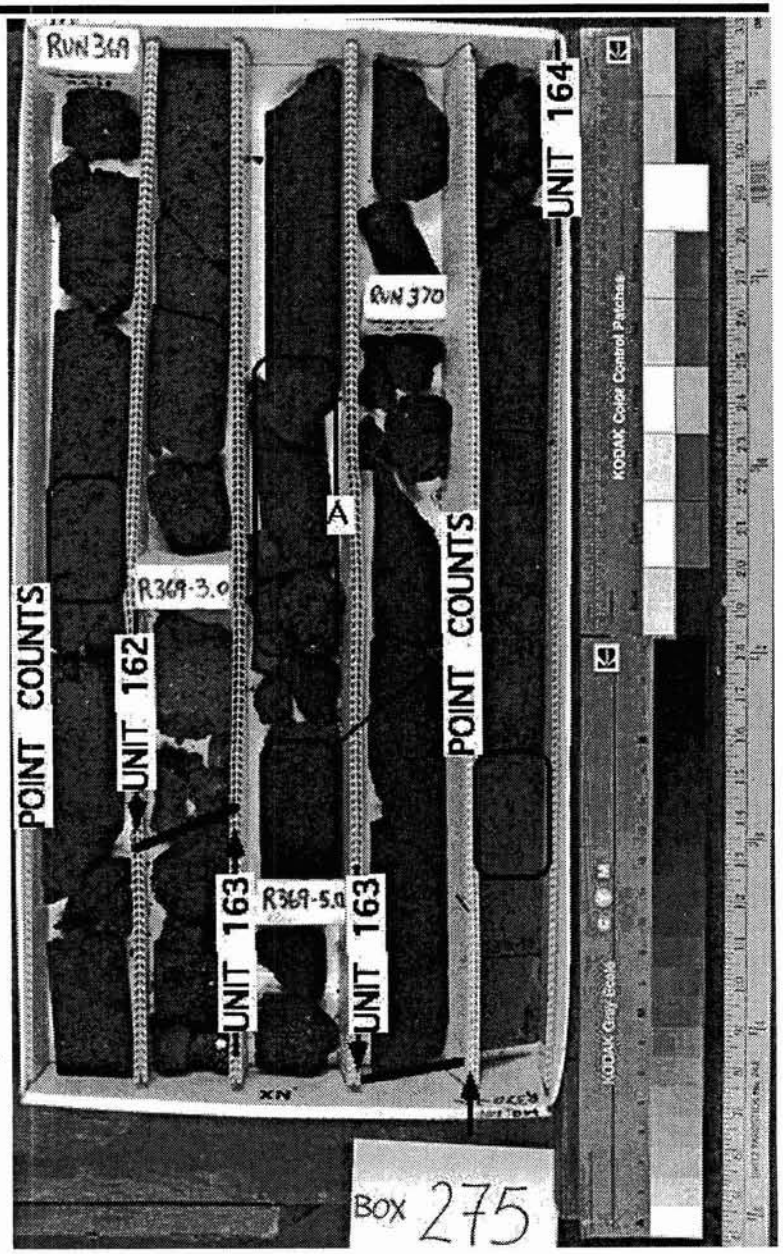
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 162

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R369-3.3-**2604.3**')(flow contact)
flow contact defined by decrease in vesicle size over a short distance in the upper flow and oxidized, clinkery material at the top of the lower flow
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 16% – 2-4 mm – equant –
16% at R369-0.7; no obvious spinel inclusions in the olivines; olivines are moderately to highly oxidized; MnO coatings
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 + 10R 3/4 – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1-8 mm – subrounded to angular – equant to elongate –
elongate vesicles have no preferred orientation
Alteration: slightly to highly (2-80% altered) –
groundmass oxidation
Veins: none
Fractures: moderately fractured: 15/3.1 ft; fractures are zones of increased oxidation
Additional comments:
minor NaCl ppt

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 163

Contacts: Top (ft): (R 369-3.3-**2604.3**')(flow contact)
Bottom (ft): (R370-1.3-**2612.3**')(flow contact)
See unit 1 for upper contact description; lower contact defined by clinkery, oxidized zone at the top of the lower flow. This clinkery zone is not strongly baked.
Unit type: pahoehoe/ transitional
pahoehoe flow textures
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 9% – 2-5 mm – equant –
9% at R369-4.9; olivine phenocrysts are very highly to completely oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: 20-40% – <1-3 mm – rounded to subrounded – equant –
Alteration: moderately to very highly (10-95% altered) –
groundmass oxidation
Veins: none
Fractures: moderately fractured
Additional comments:
this unit may consist of multiple flows - no lithologic change
see photo: "A" = two pieces with substantially larger vesicles (5-10 mm in longest dimension)

BOX 275 CONTINUED ON NEXT PAGE



Box #: 275

Cores in box
369
370

Loggers: MBB
Date logged: 12/3/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2601.0
Driller's depth:bottom [feet]: 2619.3
Core type: NQ

Units in box: 3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 164

Contacts: Top (ft): (R 370-1.3-2612.3')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 2 for contact description

Unit type: massive
aa(?)

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 13% – 2-3 mm – equant –
13% at R370-2.8; olivine phenocrysts are moderately to highly oxidized; MnO coatings
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N5 medium gray – **Structures:** – **Sorting:** –

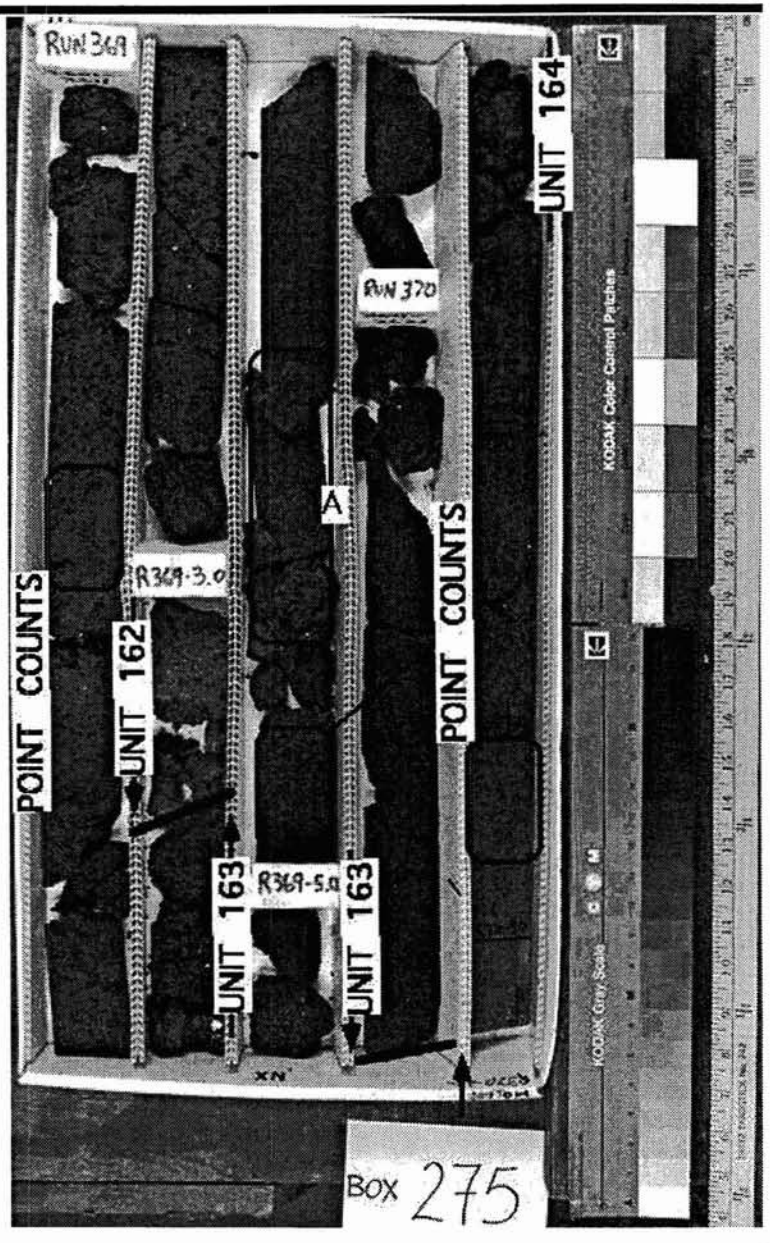
Vesicles: <5% – <1-3 mm – subangular to angular – equant to elongate –

Alteration: slightly to highly (2-80% altered) –
groundmass oxidation

Veins: none

Fractures: weakly fractured: rubbly zone at the top of the flow

Additional comments:
very rare plagioclase xenocrysts



Box #:	Cores in box
276	370 371

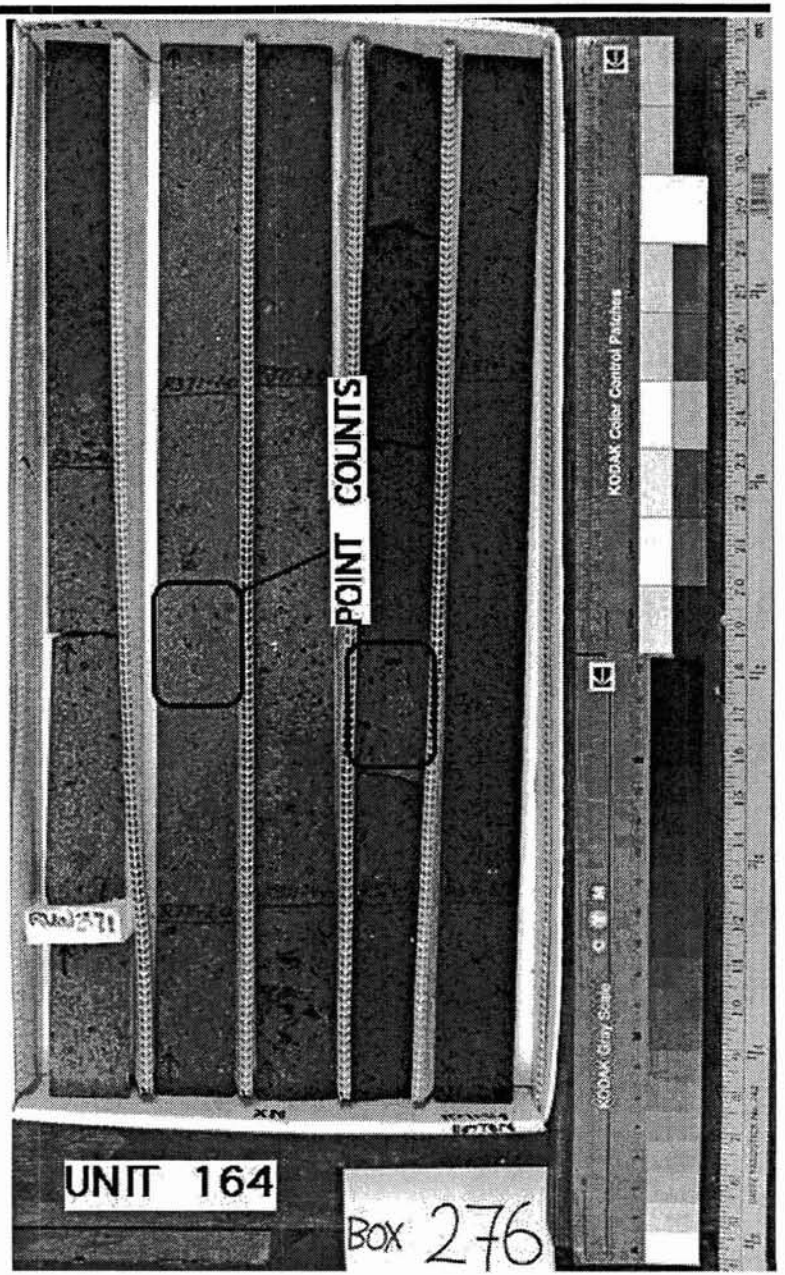
Loggers:	GFE, MG
Date logged:	12/3/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2619.3
Driller's depth:bottom [feet]:	2629.2
Core type:	NQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:164

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – – 1-5 mm – blocky (<3:1:1) –
spinel inclusions in olivine crystals; 100 pts counted at R370-4.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded – sub-horizontally elongated–
Vesicles are increasingly abundant after R371-3.0.
Alteration: fresh to slightly (<2-10% altered) –
Veins: none
Fractures: weakly: 5/10 ft
Additional comments:



Box #:	Cores in box
277	371 372 373

Loggers: GFE, MG
Date logged: 12/3/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2629.2
Driller's depth:bottom [feet]: 2645.0
Core type: NQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

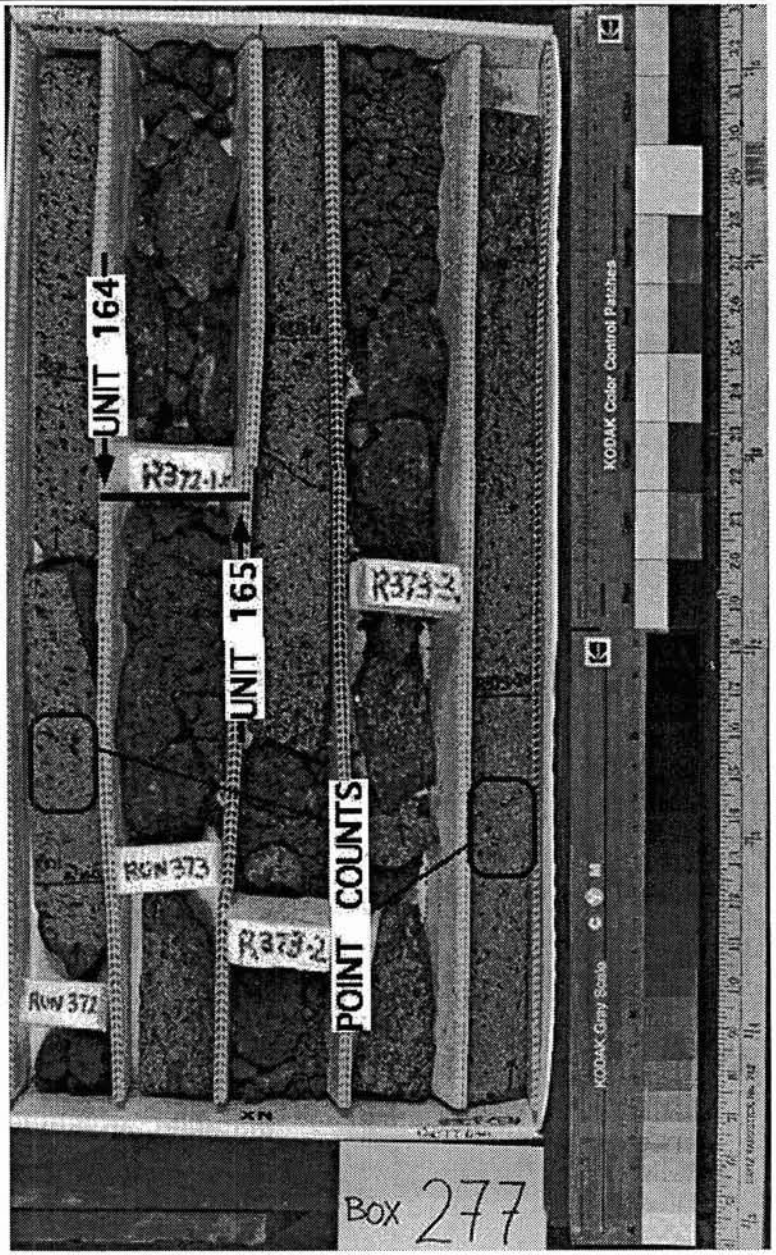
UNIT #: 164

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R372-1.0-2632.0')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~15% – 1-5 mm – tabular (>3:1:1) –
100 pts counted at R371-9.5
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: sparsely fractured
Additional comments:
NaCl ppt; base is darker gray in color

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 165

Contacts: Top (ft): (R 372-1.0-2632.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
red, baked rubble zone at top
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 14-16% – 1-5 mm – blocky (<3:1:1) – iddingsite
100 pts counted at R373-5.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: sparsely fractured
Additional comments:
NaCl ppt
Besides rubble adjacent to the contact, there are additional rubbly areas.



Box #:	Cores in box
278	373 374

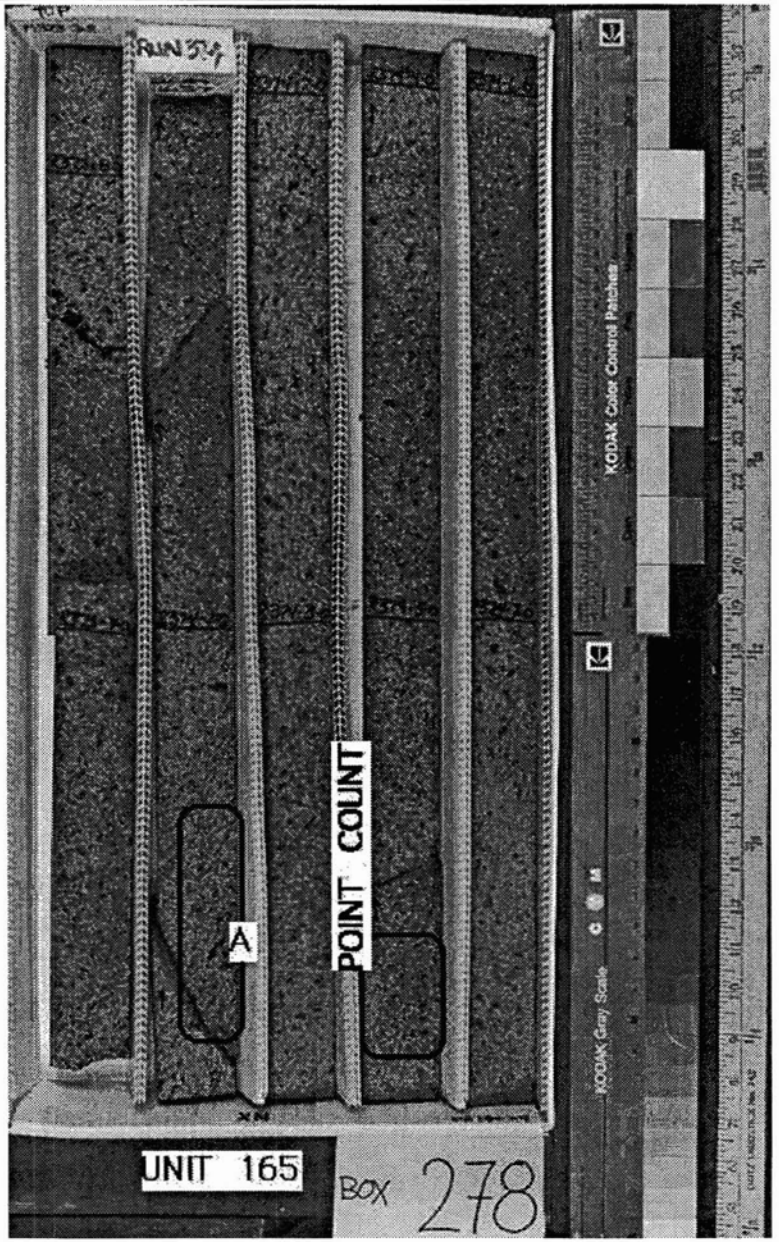
Loggers:	LLW
Date logged:	12/3/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2645.0
Driller's depth:bottom [feet]:	2654.9
Core type:	NQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:165

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to tabular – iddingsite
16% @ R374-5.8; occasional spinel inclusions; minor alteration; multi-grain clusters
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-2 mm – sub-rounded to sub-angular – equant–
vertically elongated at R374-1.6 - marked "A" on photo
Alteration: fresh (<2% altered) –
Veins:
Fractures: weakly fractured: 5/10 ft; some oxidation and light gray clays on fracture surfaces
Additional comments:
NaCl ppt



Box #: 279

Cores in box
374
375

Loggers: LLW
Date logged: 12/3/93
Checked by: MG
Check date: 12/13/93

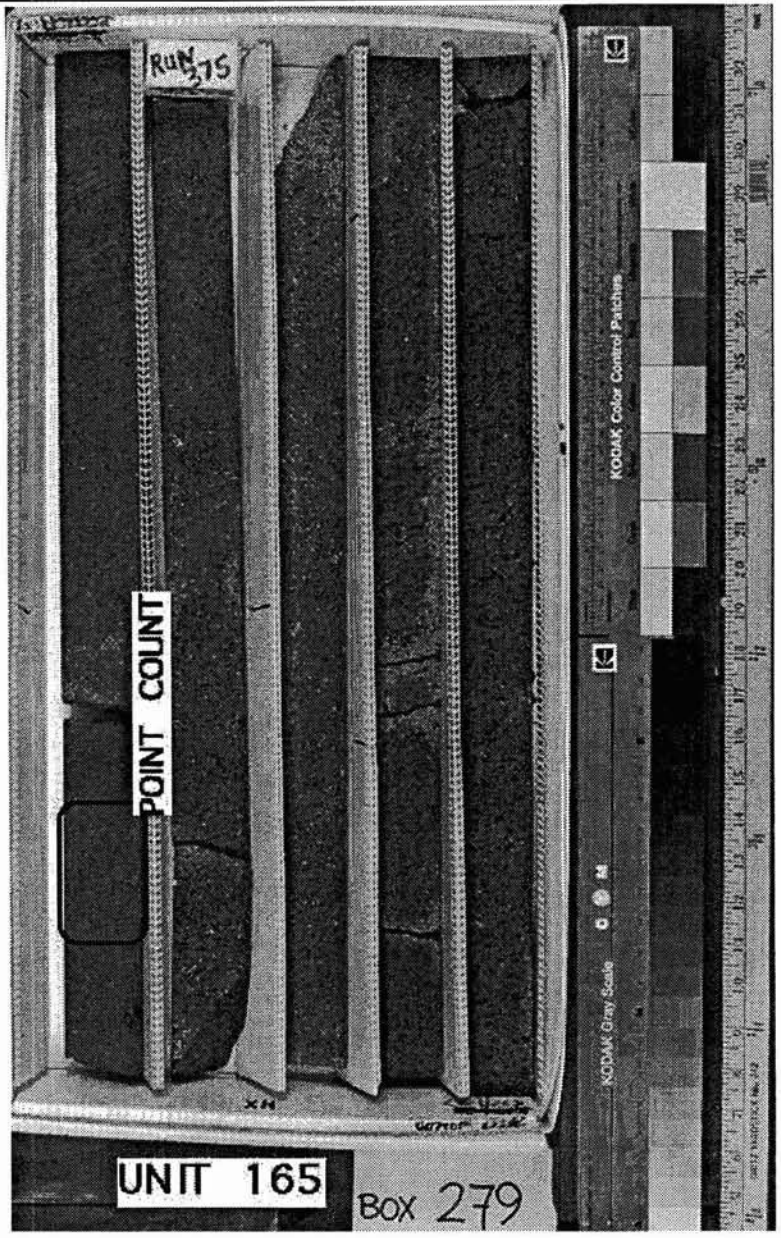
Driller's depth:top [feet]: 2654.9
Driller's depth:bottom [feet]: 2665.6
Core type: NQ

Units in box: 1

BOX UNIT 1: highly olivine phyric basalt

UNIT #:165

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to tabular – iddingsite
18% @ R374-9.4; spinel inclusions observed in fresh olivine; alteration of olivine increases downcore
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: <5% to ~5% – <1 to 3 mm – sub-angular – equant to horizontally elongated–
red oxidation starting R375-4.0
vesicle content and size gradually increase downcore
Alteration: fresh (<2% altered) –
alteration gradually increase downcore
Veins: none
Fractures: weakly fractured: 9/10 ft; some fractures fresh, some slightly oxidized, occasional light gray clays
Additional comments:
NaCl ppt



Box #:	Cores in box
280	375 376

Loggers:	GFE, MG
Date logged:	12/3/93
Checked by:	MG
Check date:	12/13/93

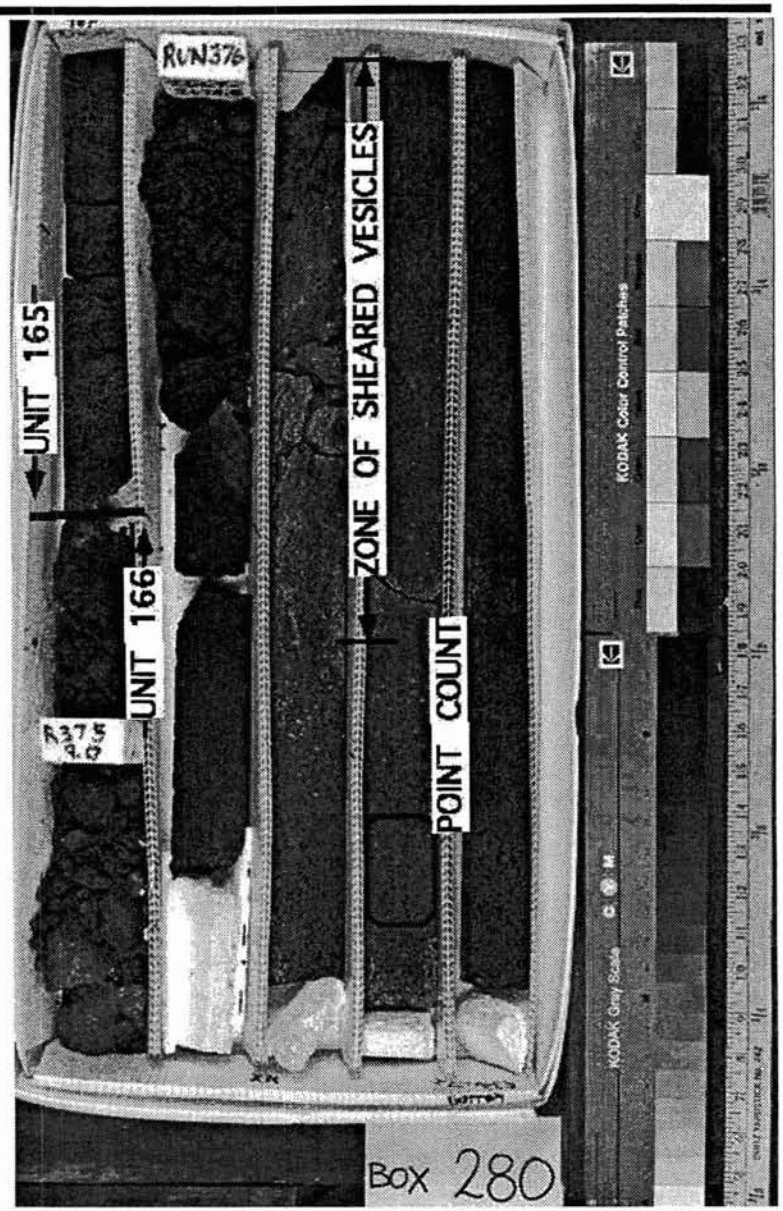
Driller's depth:top [feet]:	2665.6
Driller's depth:bottom [feet]:	2675.8
Core type:	NQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — **UNIT #: 165**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R375-8.7-2664.4')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-20% – 1-5 mm – tabular (>3:1:1) –
visual estimate
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 2/1 ft
Additional comments:
NaCl ppt

BOX UNIT 2: moderately to highly olivine phyric basalt — **UNIT #: 166**

Contacts: Top (ft): (R 375-8.7-2664.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately to highly phyric (~10%) –
olivine – 8-12% – 1-5 mm – blocky (<3:1:1) –
200 pts counted at R376-5.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-3 mm – sub-rounded – horizontally elongated–
vesicle distribution is very uneven--patchy
Alteration: slightly (2-10% altered) –
baked at contact, decreasing to fresh by R376-3.0
Veins: none
Fractures: sparsely fractured
Additional comments:
NaCl ppt; rare plagioclase xenocrysts (R376-2.0)



Box #: 281

Cores in box
376
377

Loggers: GFE, MG
Date logged: 12/4/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2675.8
Driller's depth:bottom [feet]: 2687.0
Core type: NQ

Units in box: 2

BOX UNIT 1: highly olivine phyric basalt

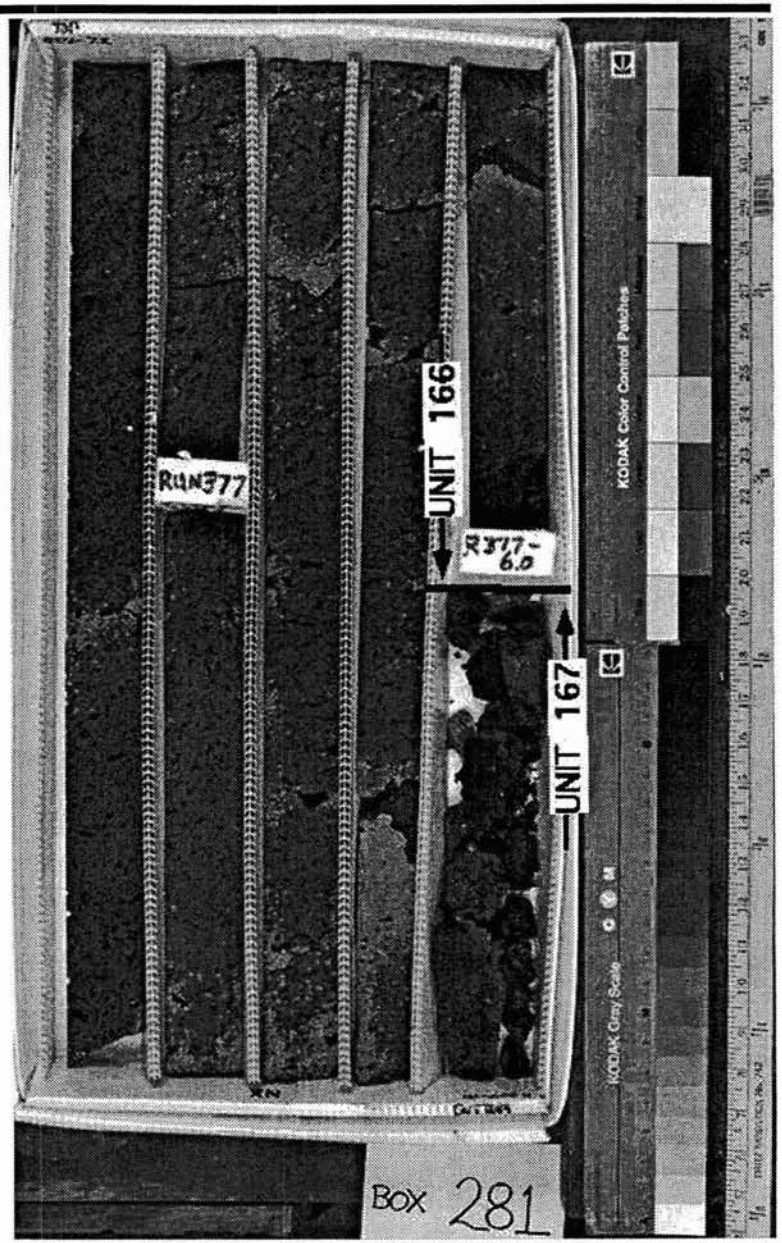
UNIT #: 166

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R377-6.0-2682.9')(flow contact)
Unit type: massive
Possibly an aa flow because of elongate, sheared vesicles.
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – blocky (<3:1:1) –
up to 1 cm crystals, 100 pts counted at R377-5.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-angular – horizontally elongated –
Vesicles mostly horizontal
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 7/9 ft
Additional comments:
NaCl ppt

BOX UNIT 2: sparsely plagioclase-olivine phyric basalt

UNIT #: 167

Contacts: Top (ft): (R 377-6.0-2682.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
lithology change
Unit type: massive
clinkery rubble
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-5 mm – blocky (<3:1:1) –
plagioclase – <1% – ~1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: 5YR 3/4 reddish-brown – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded – equant –
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: rubble
Additional comments:
rare small gabbroic inclusions



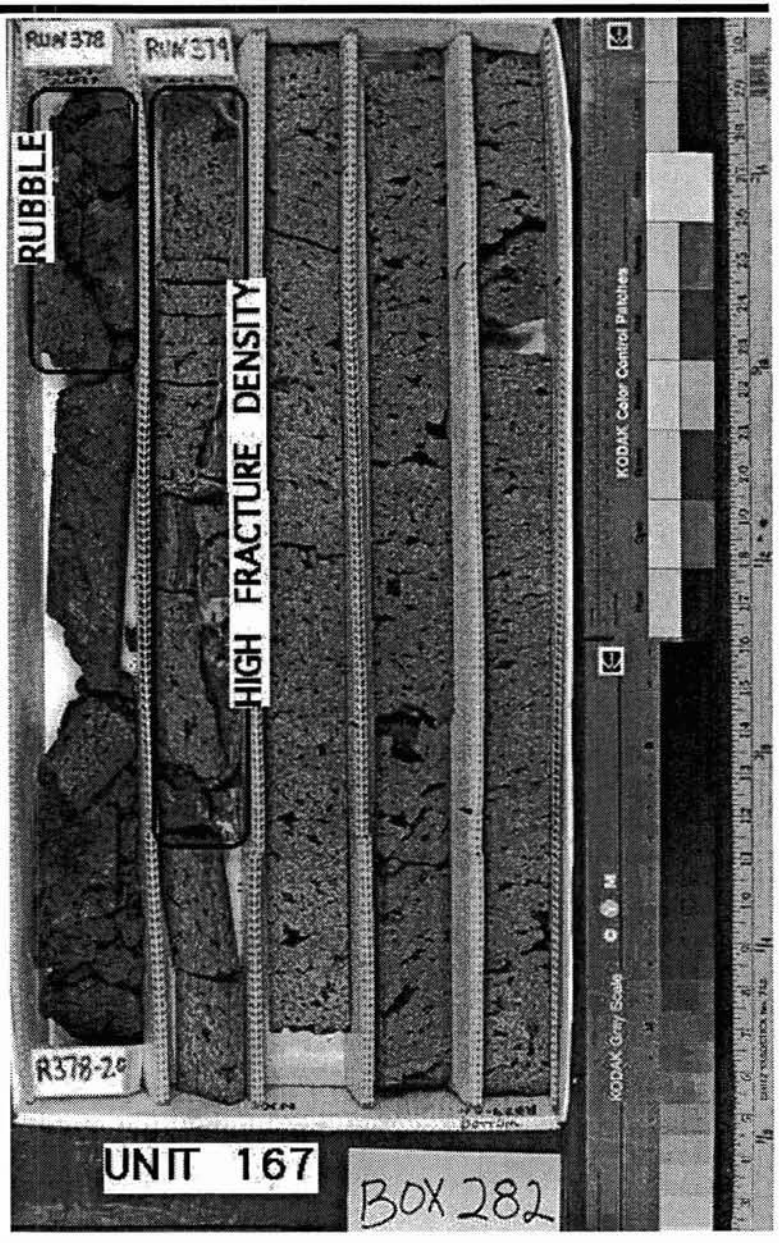
Box #:	Cores in box
282	378 379

Loggers:	LLW
Date logged:	12/4/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2687.0
Driller's depth:bottom [feet]:	2698.4
Core type:	NQ
Units in box:	1

BOX UNIT 1: moderately plagioclase-olivine phyric basalt **UNIT #:167**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
unit defined by rubbly top grading into flow with horizontally elongate vesicles
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – tabular (>3:1:1) – oxidation
5% at R379-2.1; oxidation decreases with degree of groundmass alteration
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR3 grayish brown to N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-10 mm – sub-angular – equant to horizontally elongated–
light colored clay
color grades from 5YR3 to N4 as alteration decreases (see below)
Alteration: slightly (2-10% altered) –
very highly oxidized in rubbly zone at top of box (R378-0.0 to 0.7), to slightly altered by R379-0.0
Veins: none
Fractures: R378-0.0 to R378-2.0: rubbly. R378-2.0 to R378-3.4: highly fractured. R378-3.4 to R378-7.9 (end of box): weakly fractured (9/4.5 ft). Fractures show occasional oxidation and light gray clay coating.
Additional comments:
microgabbro inclusions



Box #: 283

Cores in box
379
380
381

Loggers:	GFE, MG
Date logged:	12/4/93
Checked by:	MG
Check date:	12/13/93

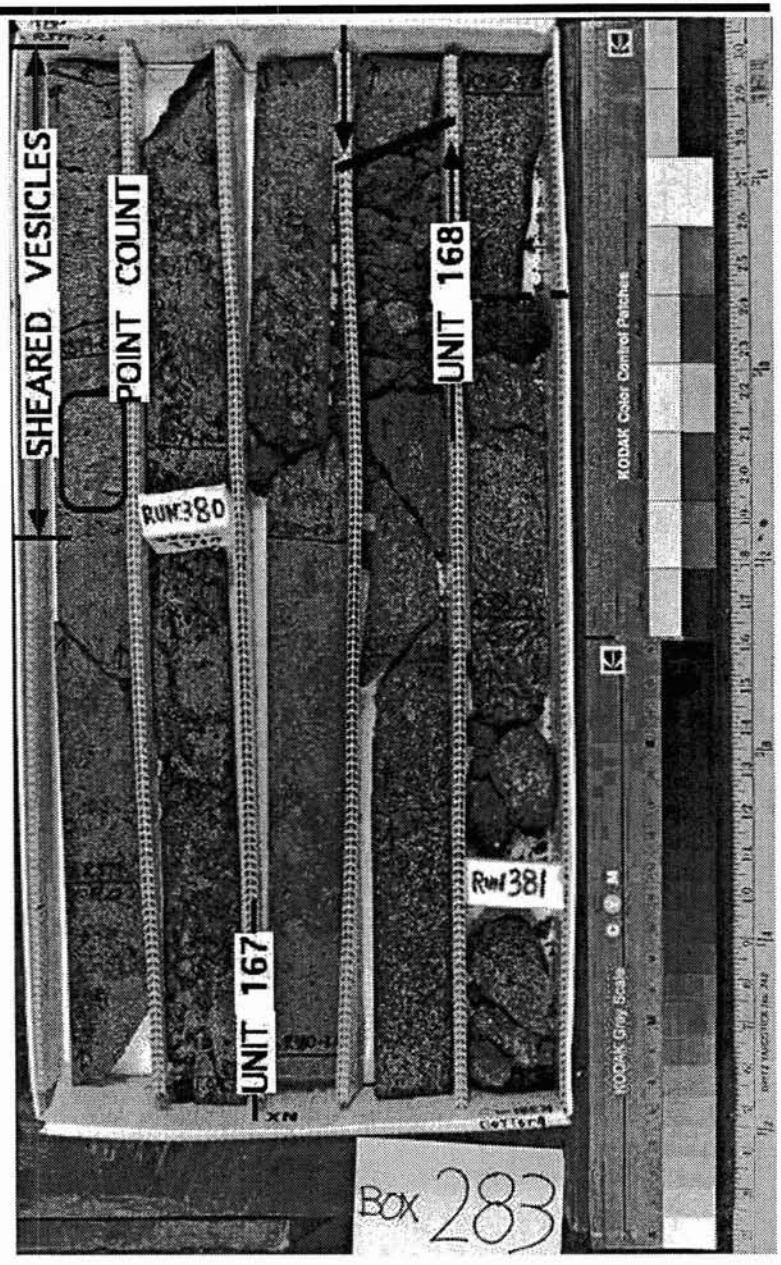
Driller's depth:top [feet]:	2698.4
Driller's depth:bottom [feet]:	2712.3
Core type:	NQ
Units in box:	2

BOX UNIT 1: moderately plagioclase-olivine phyric basalt — UNIT #: 167

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R380-3.2-2704.3')(flow contact)
clinkery rubble with change of lithology
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 4% – 1-5 mm – blocky (<3:1:1) –
100 pts counted at R379-8.2
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N6 gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly: 5/6 ft
Additional comments:
NaCl ppt. Core has areas of increased vesicularity, especially near fractures.

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 168

Contacts: Top (ft): (R 380-3.2-2704.3')(flow contact)
Bottom (ft): (R--')(continuous with next box)
internal contact at R380-5.4
Unit type: pahoehoe
Although clinkery at contact, vesicles are round and equant implying a pahoehoe flow.
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-5 mm – blocky (<3:1:1) –
visual estimate
– – – –
– – – –
Groundmass/Matrix: –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: moderately: 10/4 ft
Additional comments:
NaCl ppt



Box #: 284

Cores in box
381
382

Loggers: LLW
Date logged: 12/4/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2712.3
Driller's depth:bottom [feet]: 2722.0
Core type: NQ

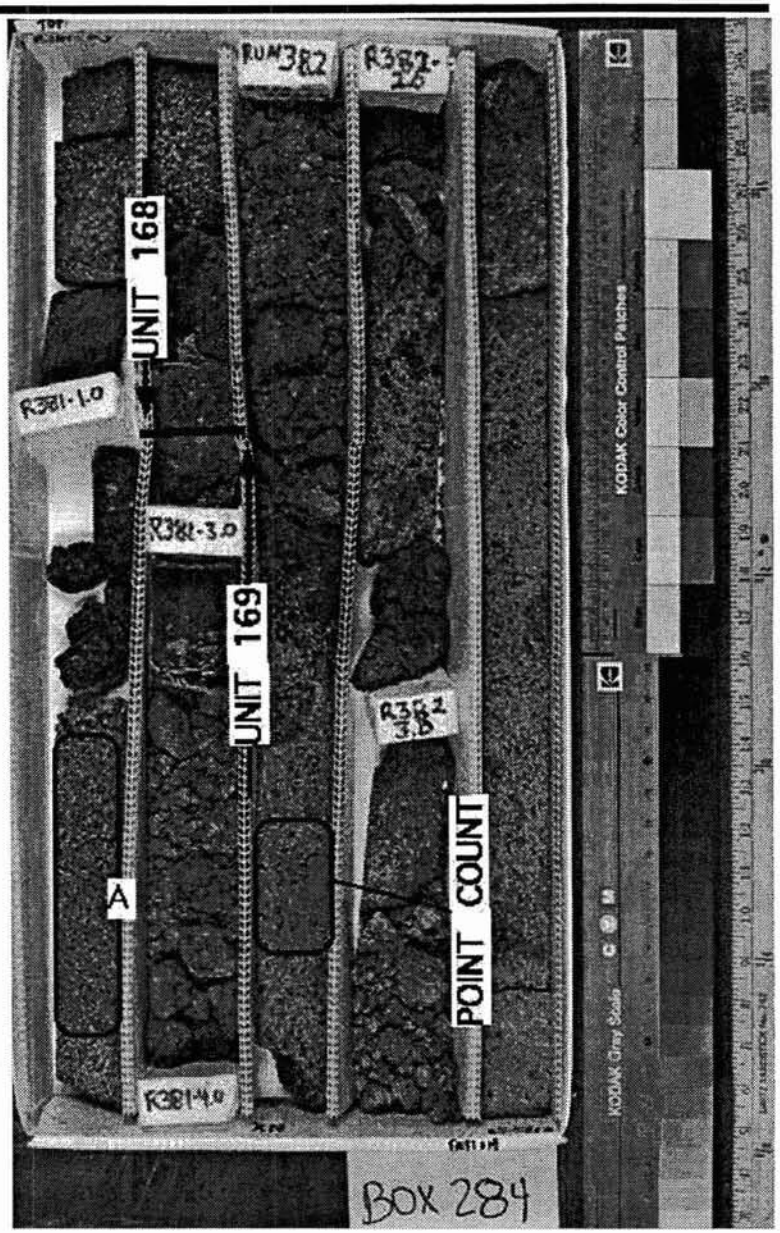
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 168

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R381-2.8-2712.8')(flow contact)
flow contact defined by baked zone at top of unit 2 and lithologic change
Unit type: pahoehoe
defined by abundance of sub-rounded vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to tabular – iddingsite
11% @ R381-2.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – sub-rounded – equant (but see comment) –
minor red oxidation
marked "A" on photo - area where vesicles appear to have coalesced
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: moderately fractured: 10/2.7 ft; oxidation along fractures
Additional comments:

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 169

Contacts: Top (ft): (R 381-2.8-2712.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: massive
baked zone at top of unit grading into rubbly zone then into massive flow (see photo)
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – – 1-4 mm – tabular (>3:1:1) – iddingsite
10% @ R382-1.5; 15% @ R382-4.5; huge olivines (~1 cm)
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: ~5% – 1-3 mm – sub-rounded to sub-angular – equant to vertically elongated –
oxidation
Alteration: fresh to completely (<2-100% altered) –
completely oxidized in baked zone at top of unit grading into fresh massive flow
Veins: none
Fractures: weakly - not including rubbly zone from R381-3.0 to R382-0.9 and R382-3.3 to 3.7 (see photo)
Additional comments:



Box #: 285

Cores in box	
382	385
383	
384	

Loggers: GFE, MG
Date logged: 12/4/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2722.0
Driller's depth:bottom [feet]: 2737.0
Core type: NQ

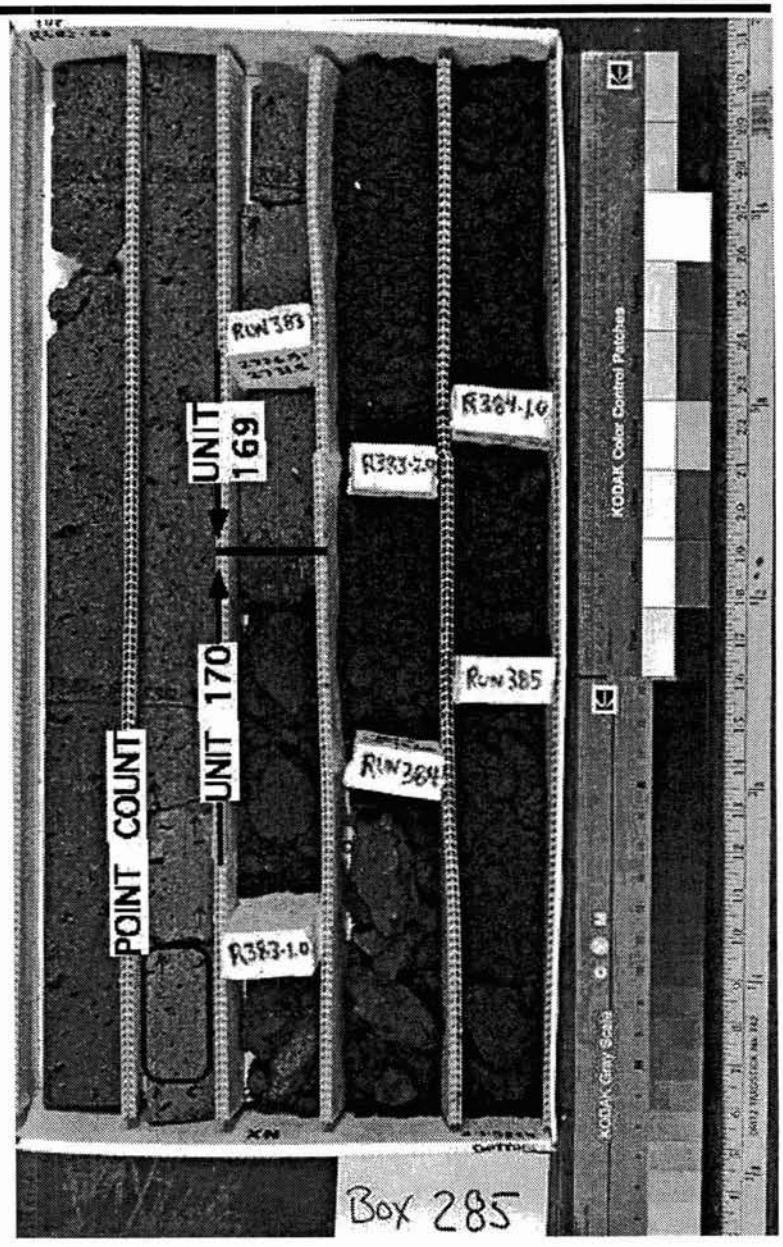
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 169

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R383-0.4-**2726.7**')(flow contact)
base marked by reddish soil
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~20% – 1-5 mm – tabular (>3:1:1) –
100 pts counted at R382-9.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 4/5 ft
Additional comments:
NaCl ppt

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 170

Contacts: Top (ft): (R 383-0.4-**2726.7**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-4% – 1-5 mm – blocky (<3:1:1) – iddingsite
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – spherical – equant –
Only could determine vesicle abundance using a small piece of core. Rest of section is very weathered.
Alteration: moderately (10-40% altered) –
Altered areas are dark red/brown - 5YR-3/4 on USGS color chart.
Veins: none
Fractures: No fractures, just weathered, soil-like rubble.
Additional comments:



Box #:	Cores in box
286	385 386

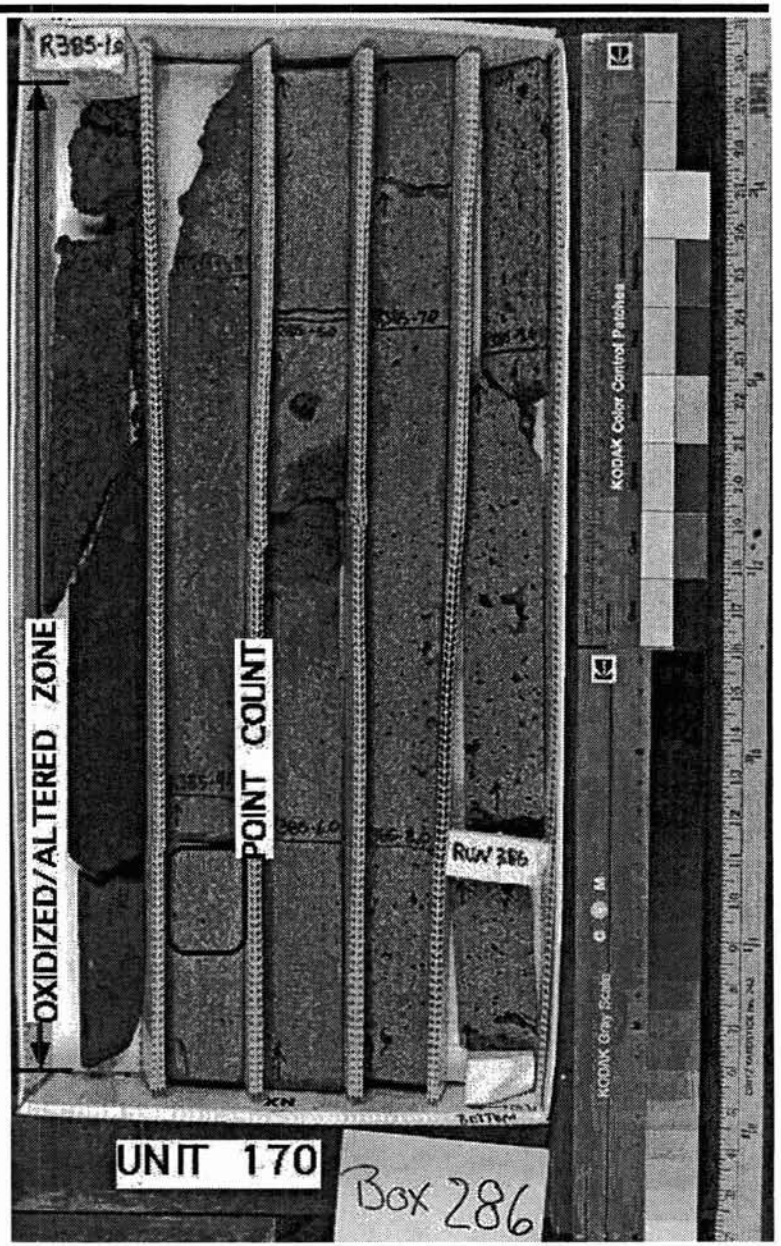
Loggers:	GFE, MG
Date logged:	12/4/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2737.0
Driller's depth:bottom [feet]:	2746.3
Core type:	NQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:170

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 3-4% – 1-5 mm – blocky (<3:1:1) – iddingsite
100 pts at R385-4.2
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded – horizontally elongated –
There are some highly vesicular inclusions that are darker in color — around N3-dark gray.
Alteration: slightly (2-10% altered) –
Altered zone in top 2 feet of core, from R385-1.0 to 3.0.
Veins: none
Fractures: weakly: 5/10 ft
Additional comments:
NaCl ppt



Box #: 287

Cores in box: 386

Loggers: LLW
Date logged: 12/4/93
Checked by: MG
Check date: 12/13/93

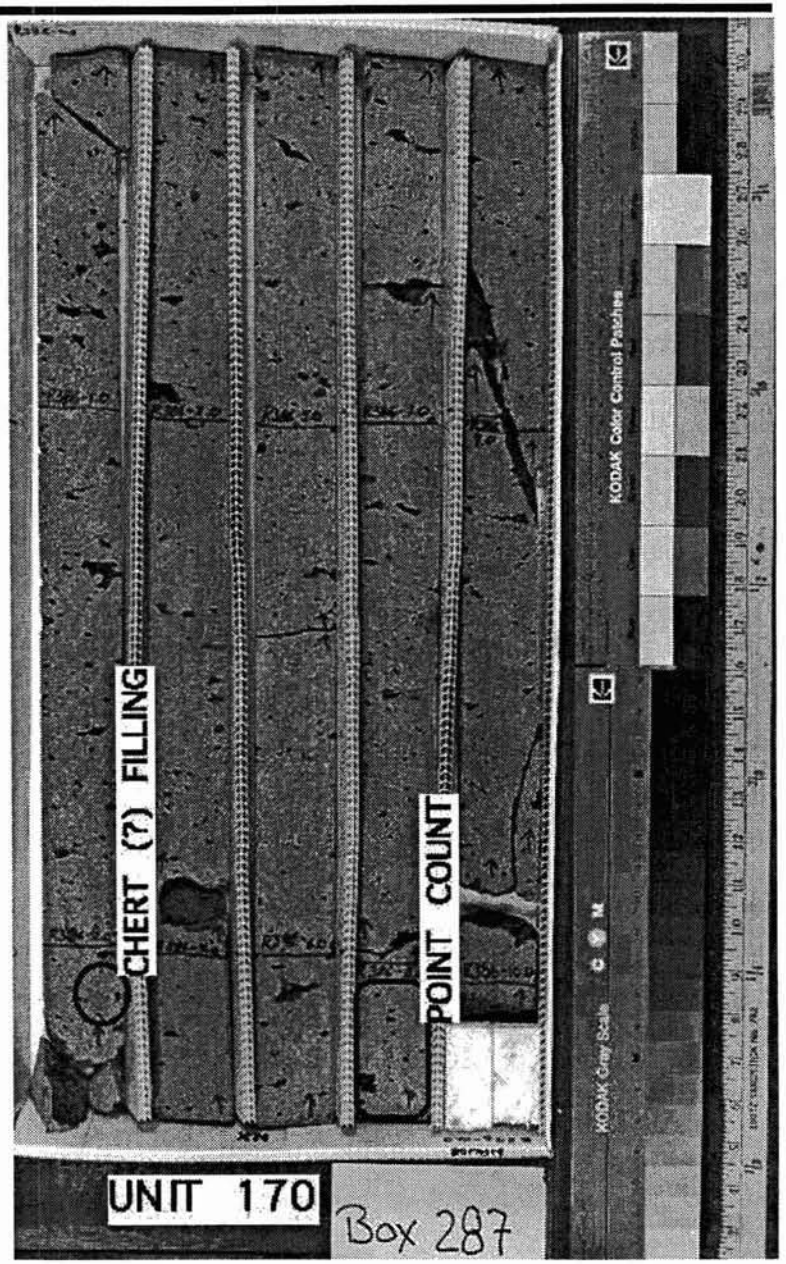
Driller's depth:top [feet]: 2746.3
Driller's depth:bottom [feet]: 2756.0
Core type: NQ

Units in box: 1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:170

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-3 mm – equant to tabular – occasional oxidation
4% @ R386-8.2; rare xenocrysts (?)
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded to sub-angular – horizontally elongated–
occasional oxidation
occasional >1 cm vesicles; one chert (?) filling (see photo for location)
Alteration: fresh to slightly (<2-10% altered) –
Veins: none
Fractures: weakly fractured: 11/8.8 ft; some light colored clays on fracture surfaces
Additional comments:
rare olivine-plagioclase clots



Box #:	Cores in box
288	387 388

Loggers:	GFE, MG
Date logged:	12-04-93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2756.0
Driller's depth:bottom [feet]:	2766.5
Core type:	NQ
Units in box:	3

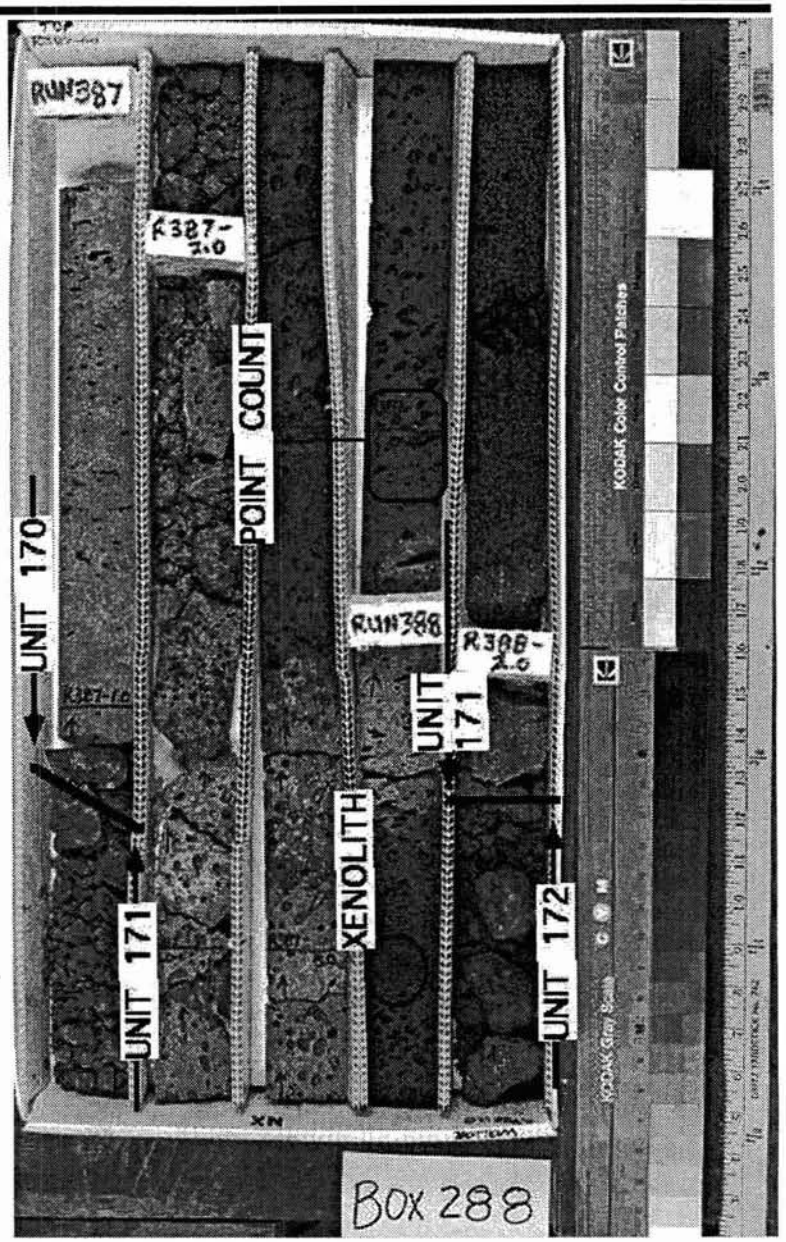
BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 170

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R387-1.1-2757.1')(flow contact)
Weathered, baked at contact. Lithologic change between sections (see photo).
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – blocky (<3:1:1) –
olivine phenocrysts contain some spinel inclusions
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly
Additional comments:
autoliths

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 171

Contacts: Top (ft): (R 387-1.1-2757.1')(flow contact)
Bottom (ft): (R388-2.2-2764.5')(flow contact)
red baked rubbly top
Unit type: transitional
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1% – 1-5 mm – blocky (<3:1:1) –
200 pts counted at R387-6.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – >5 mm – spherical – equant –
Some vesicles are large, >5 mm until about R388-0.0, where they decrease from around 3 to 1 mm. Also, some dark highly vesicular basalt inclusions within this section of core.
Alteration: moderately to highly (10-80% altered) –
Alteration extreme at contact, but decreases gradationally.
Veins: none
Fractures: sparsely fractured
Additional comments:
NaCl ppt; autoliths

BOX 288 CONTINUED ON NEXT PAGE



Box #: 288

Cores in box
387
388

Loggers: GFE, MG
Date logged: 12-04-93
Checked by: MG
Check date: 12/13/93

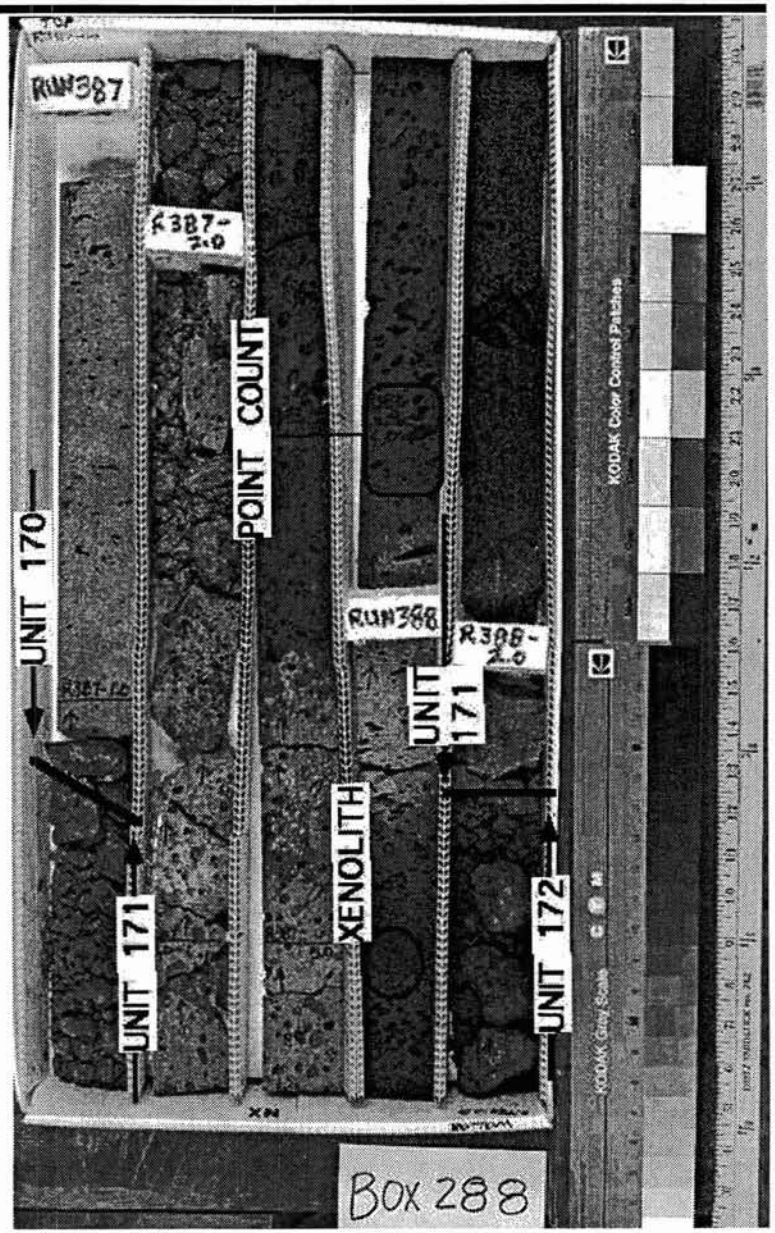
Driller's depth:top [feet]: 2756.0
Driller's depth:bottom [feet]: 2766.5
Core type: NQ

Units in box: 3

BOX UNIT 3: aphyric basalt

UNIT #: 172

Contacts: Top (ft): (R 388-2.2-2764.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Unit type: rubble
Friable mostly with some more coherent pieces in section (See box 289).
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N3 gray– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-angular – equant–
Determination made from small pieces inside friable, weathered matrix.
Alteration: highly (40-80% altered) –
Veins: none
Fractures: sparsely fractured
Additional comments:
Color determination made from coherent pieces of basalt. Color of weathered matrix close to 10YR-2/2 on USGS color chart.



Box #:	Cores in box
289	389 390

Loggers:	GFE
Date logged:	12/4/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2766.5
Driller's depth:bottom [feet]:	2779.6
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:172

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Possible flow contact at ~R390-0.0, but dubious since no bake zone is seen.

Unit type: aa
With distinct zones of clinkery rubble.

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1 mm – blocky (<3:1:1) –
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

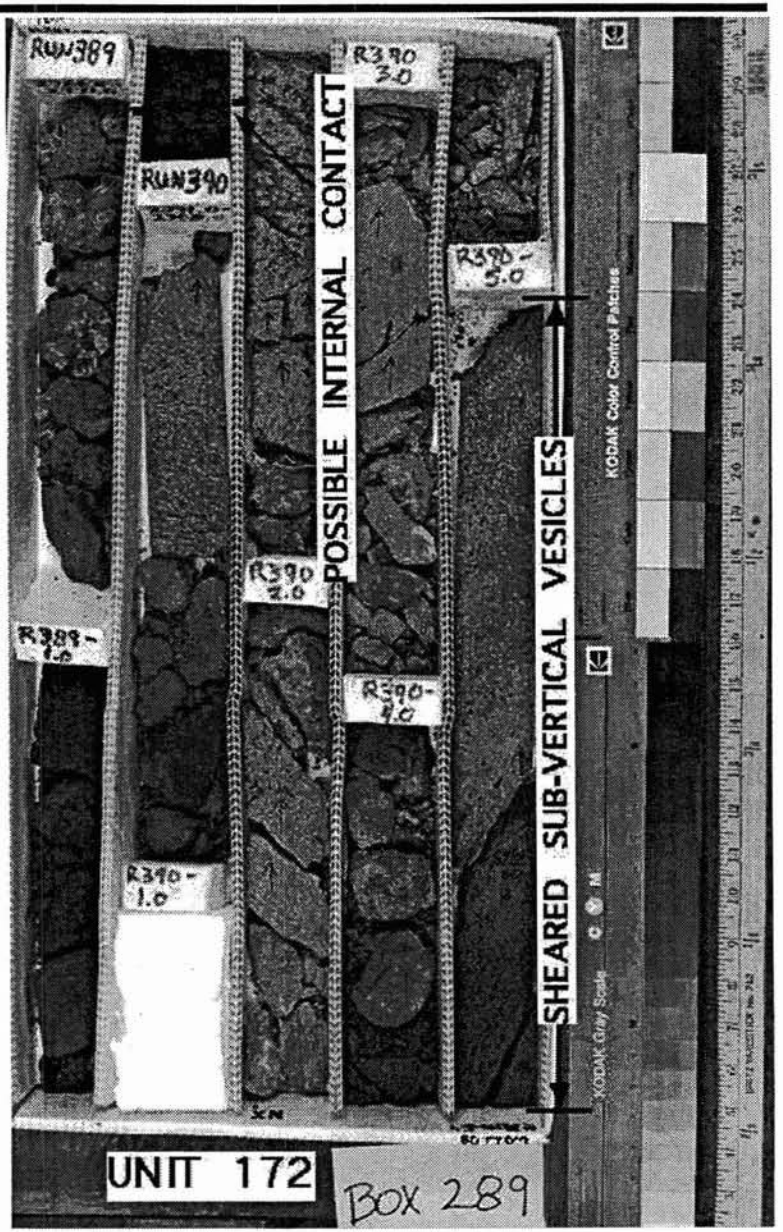
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant–
Vesicles are sheared and sub-vertical elongate moving down the core from R389-1.0.

Alteration: moderately (10-40% altered) – clay (?)
friable matrix with possible clay

Veins: none

Fractures: moderately

Additional comments:
NaCl ppt



Box #: 290

Cores in box	
390	393
391	394
392	

Loggers: MG
Date logged: 12/4/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2779.6
Driller's depth:bottom [feet]: 2802.3
Core type: NQ

Units in box: 2

BOX UNIT 1: aphyric basalt

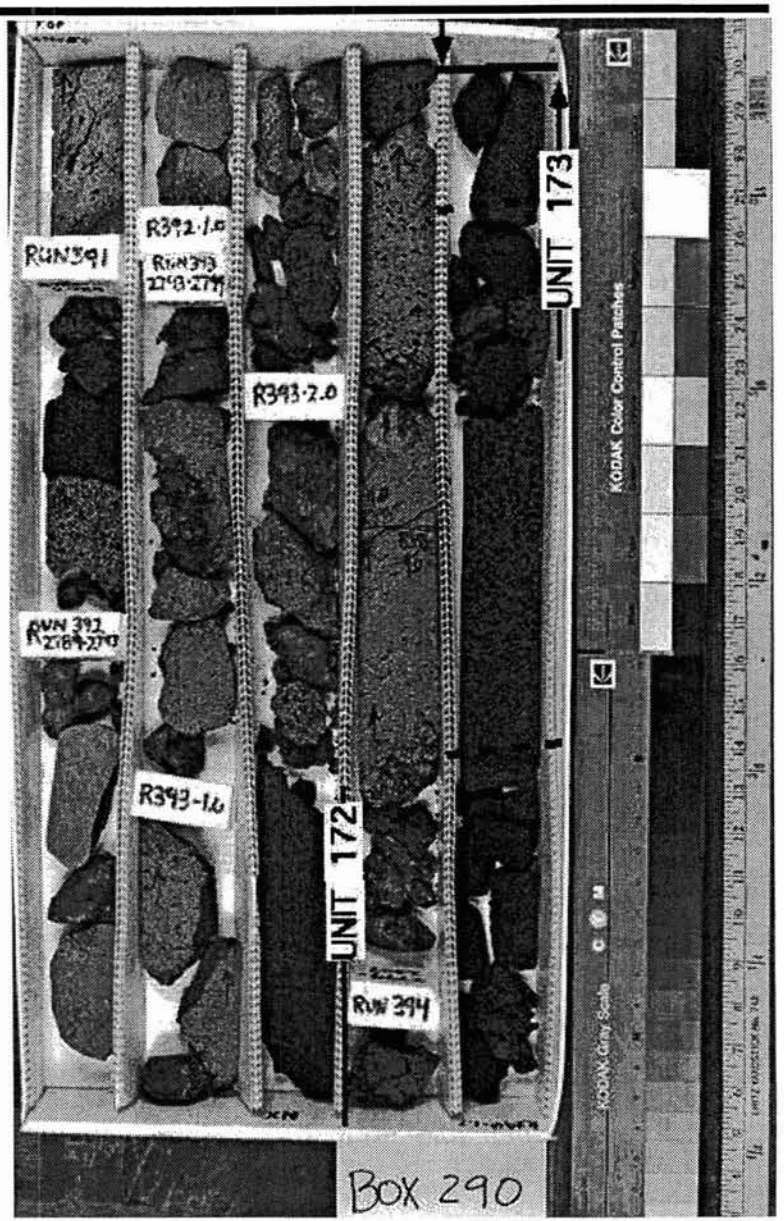
UNIT #: 172

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R394-0.2-2799.2')(flow contact)
base picked on red color and vesicularity change
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1 mm – equant –
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-angular – inclined–
variable orientation
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: moderately
Additional comments:

BOX UNIT 2: aphyric basalt

UNIT #: 173

Contacts: Top (ft): (R 394-0.2-2799.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
internal contacts at R394-0.2 and 1.0
Unit type: pahoehoe
contains rubbly internal contact (see photo)
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-5 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: 5YR 3/2 gray-brown– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – spherical – equant–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: sparsely fractured
Additional comments:



Box #:	Cores in box
291	394 395

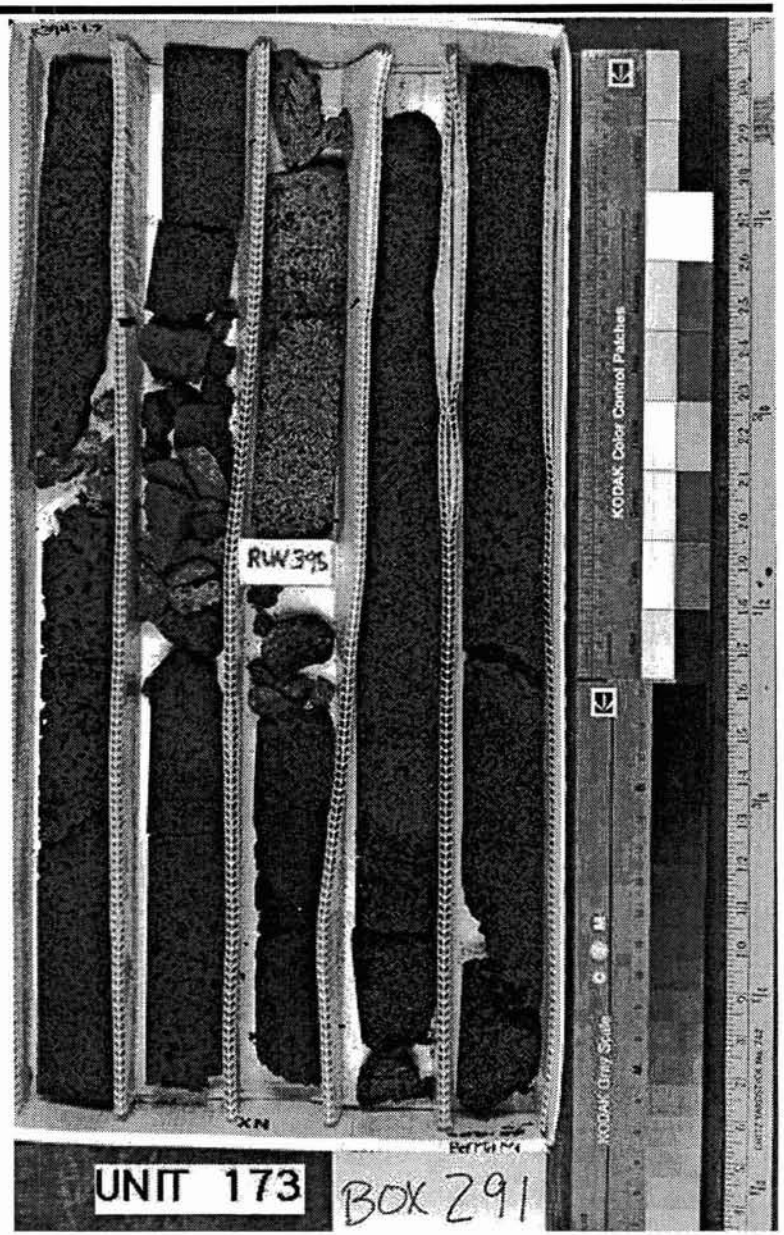
Loggers:	GFE
Date logged:	12/4/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2802.3
Driller's depth:bottom [feet]:	2812.7
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:173

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
possible internal contact (see photo)
Phenocrysts/Clasts:
aphyric (<1%) – no visible phenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – spherical – equant–
Vesicles become smaller at rubbly area that is possibly an internal contact zone. Vesicles vary in size in a non-systematic fashion throughout box.
Alteration: slightly (2-10% altered) –
Alteration found at internal contacts.
Veins: none
Fractures: weakly (6/4 ft) to rubbly
Additional comments:
NaCl ppt



Box #: 292

Cores in box
395
396

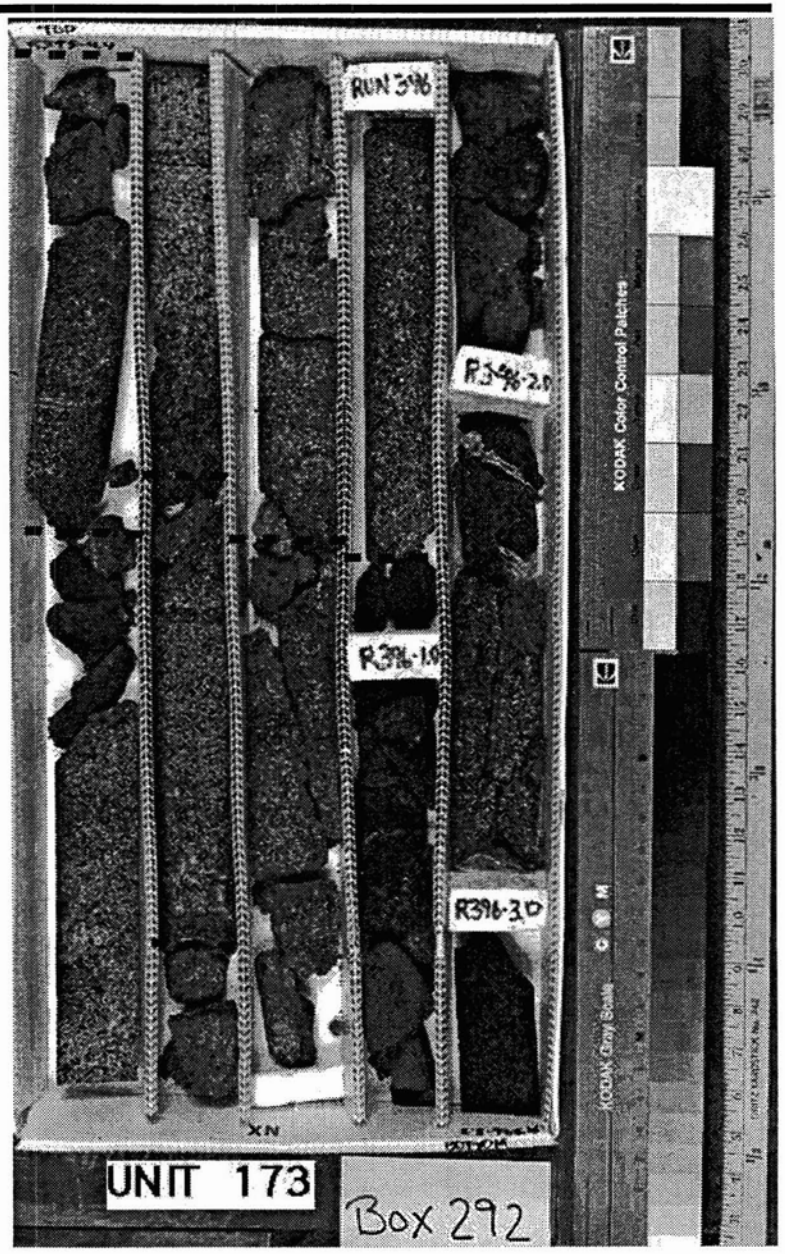
Loggers: LLW
Date logged: 12/4/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2812.7
Driller's depth:bottom [feet]: 2821.4
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric basalt **UNIT #:173**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
possible internal flow contacts marked by oxidized rubbly zones at R395-4.4, R395-5.2, R395-7.1, R395-8.0, R395-9.2, R396-0.9 (marked on photo) but no lithologic change or other evidence for time break observed; fluid-like, glassy surface on some
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-2 mm – sub-rounded – equant – oxidation near possible internal flow contacts
Alteration: fresh to moderately (<2-40% altered) – moderately oxidized near possible internal flow contacts
Veins: none
Fractures: weakly fractured between possible internal flow contacts, rubbly near possible internal flow contacts (see photo)
Additional comments:
NaCl ppt



Box #: 293

Cores in box
396
397

Loggers: LLW
Date logged: 12/4/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2821.4
Driller's depth:bottom [feet]: 2828.6
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:173

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
possible internal flow contacts marked by oxidized, rubbly zones at R396-6.3 and R397-0.4 (see photo) but no lithologic change or other evidence for a time break observed

Unit type: pahoehoe
abundant sub-rounded vesicles

Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

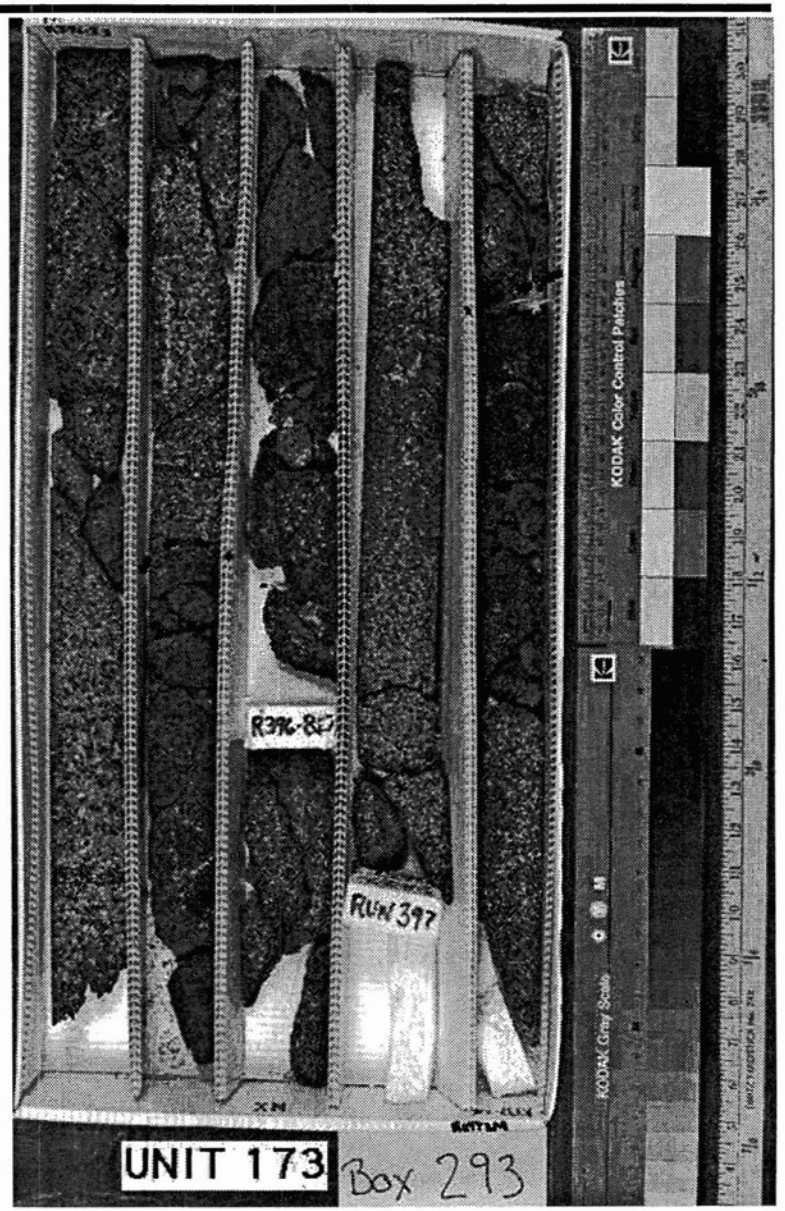
Vesicles: >30% – 1-4 mm – rounded to sub-rounded – equant – some oxidation

Alteration: fresh (<2% altered) –

Veins: none

Fractures: moderate to rubbly

Additional comments:
NaCl ppt



Box #: 294

Cores in box
397
398

Loggers:	LLW
Date logged:	12/5/93
Checked by:	MG
Check date:	12/13/93

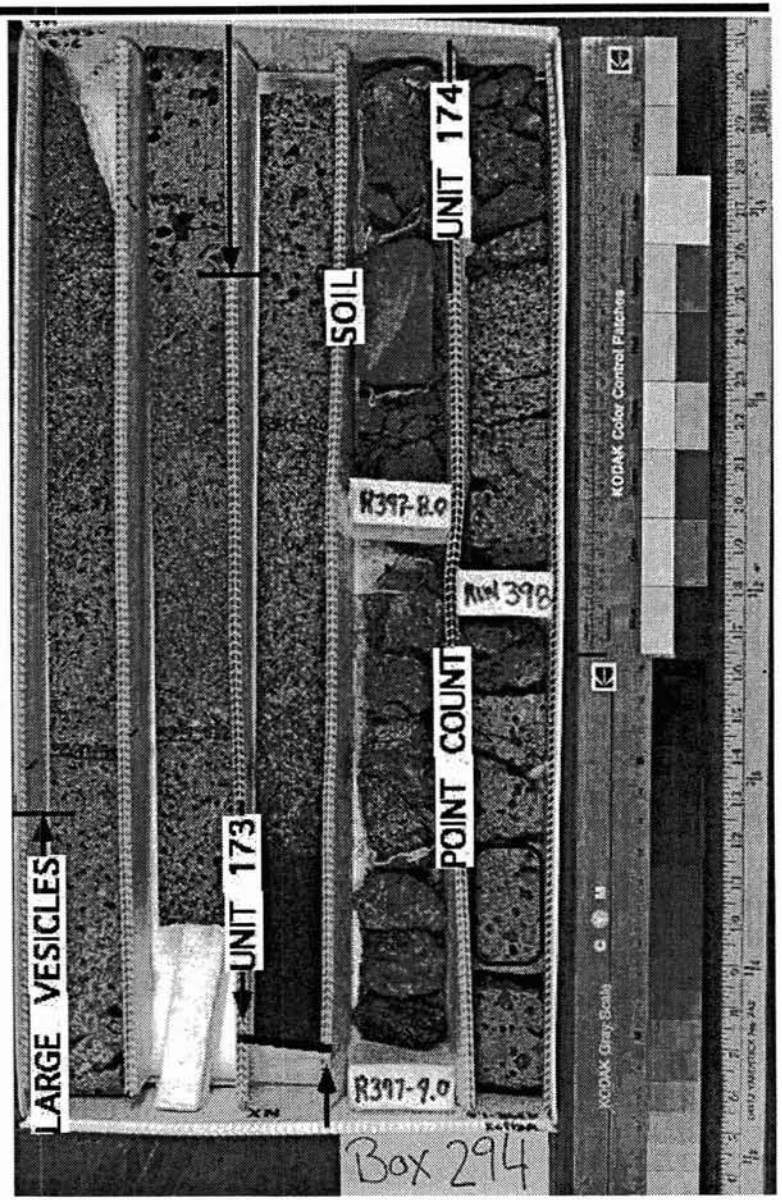
Driller's depth:top [feet]:	2828.6
Driller's depth:bottom [feet]:	2838.0
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 173

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R397-7.2-**2834.2**')(flow contact)
flow contact defined by presence of soil
Unit type: pahoehoe
type defined by presence of large sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – rounded to sub-rounded – equant–
occasional vesicle to >1 cm especially from R397-3.5 to R397-4.2
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 3/5.4 ft; white clay on fracture at top of box
Additional comments:
NaCl ppt

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 174

Contacts: Top (ft): (R 397-7.2-**2834.2**')(erosional)
Bottom (ft): (R--')(continuous with next box)
contact defined by beginning of weathered soil layer
Unit type: pahoehoe
defined by presence of large, sub-rounded vesicles
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-4 mm – equant – iddingsite
5% @ R398-0.6; slight alteration to iddingsite; no spinel observed
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-10 mm – sub-rounded – equant–
slight oxidation
vesicle size increases down core
Alteration: slightly (2-10% altered) – oxidation
Veins: none
Fractures: rubbly at top to heavily fractured by end of box; fractures clay coated
Additional comments:



Box #: 295

Cores in box
398
399

Loggers: GFE, MG
Date logged: 12-05-93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2838.0
Driller's depth:bottom [feet]: 2847.3
Core type: NQ

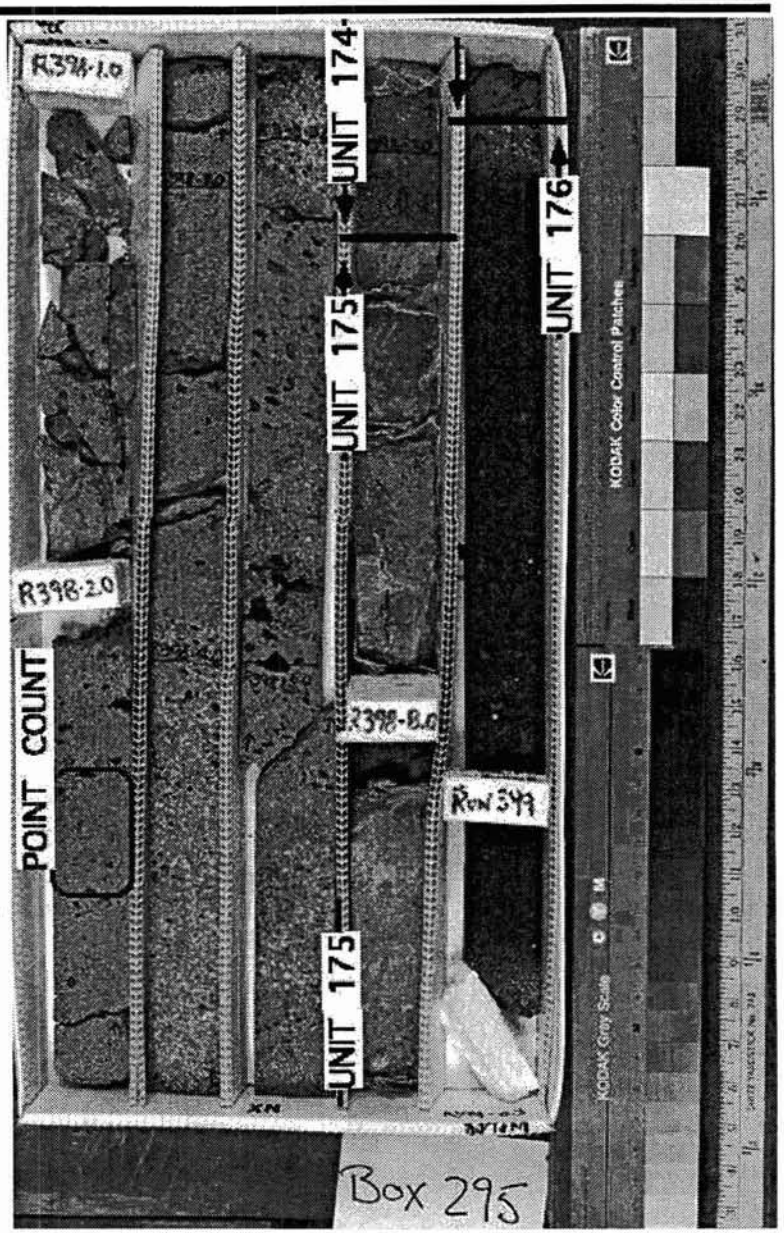
Units in box: 3

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 174

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R398-7.2-2844.2')(flow contact)
Unit type: massive
Except for rubbly zone between R398-1.0 to R398-2.0.
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15% – 1-5 mm – blocky (<3:1:1) –
100 pts @ R398-2.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant –
Some yellowish brown clay lines the insides of some of the vesicles and also appears at fracture boundaries.
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 5/4 ft
Additional comments:
NaCl ppt

BOX UNIT 2: well-sorted, fine-grained volcanic sand — UNIT #: 175

Contacts: Top (ft): (R 398-7.2-2844.2')(flow contact)
Bottom (ft): (R398-8.8-2845.8')(depositional)
Sand does not appear to be particularly baked at flow contact.
Unit type: volcaniclastic sand
Phenocrysts/Clasts:
–
olivine – 20-30% – 1-5 mm – blocky (<3:1:1) –
glass – – <1 mm – tabular (>3:1:1) – clay completely replaces glass
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: 5YR-6/1 light brownish-gray – **Structures:** unbedded – **Sorting:** well-sorted –
Vesicles: none – – – –
Alteration: highly (40-80% altered) –
Veins: none
Fractures: none
Additional comments:
NaCl ppt; olivine-rich volcanic sand



BOX 295 CONTINUED ON NEXT PAGE

Box #:	Cores in box
295	398 399

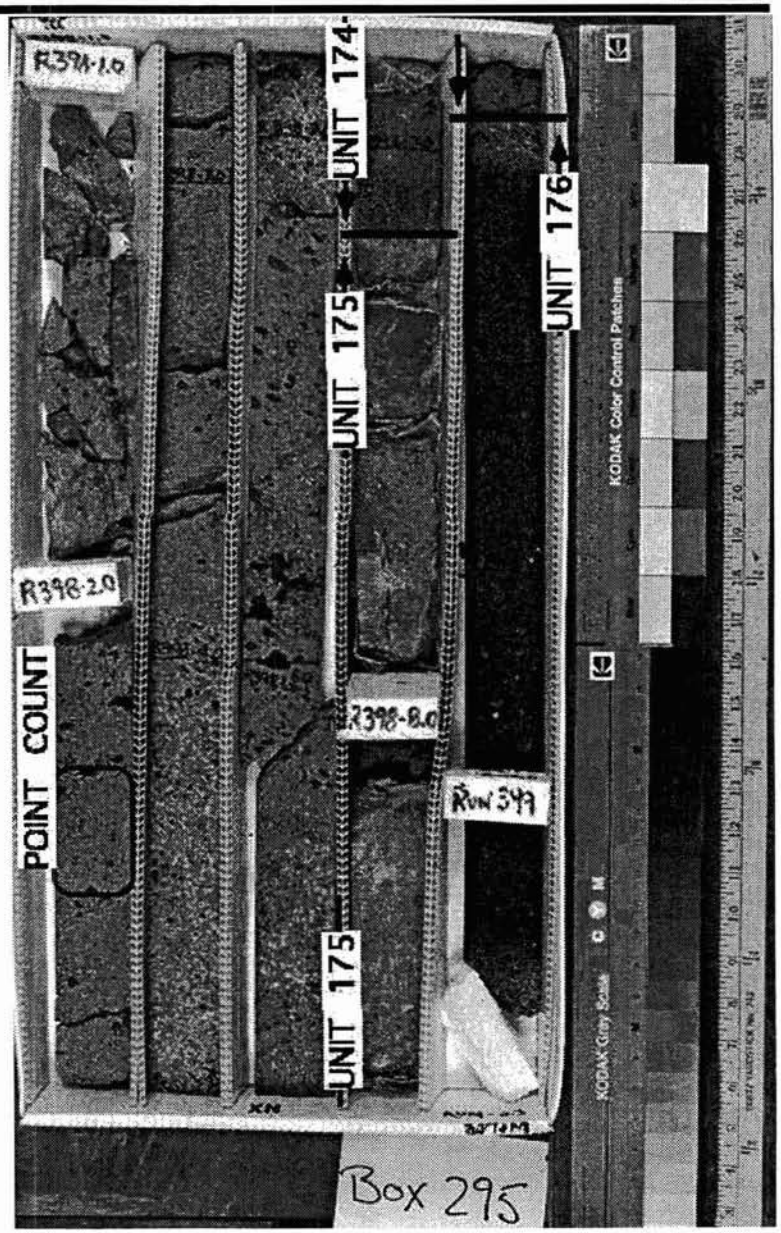
Loggers:	GFE, MG
Date logged:	12-05-93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2838.0
Driller's depth:bottom [feet]:	2847.3
Core type:	NQ
Units in box:	3

BOX UNIT 3: aphyric basalt

UNIT #: 176

Contacts: Top (ft): (R 398-8.8-2845.8')(depositional)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Possibly a pahoehoe flow because of rounded, equant vesicularity.
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 1/2 ft
Additional comments:
NaCl ppt



Box #:	Cores in box
296	399 400

Loggers:	LLW
Date logged:	12/5/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2847.3
Driller's depth:bottom [feet]:	2857.7
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric to moderately phyric basalt — UNIT #: 176

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R399-8.5-2855.5')(flow contact)
lithology change and red zone at base

Unit type: pahoehoe
abundant sub-rounded vesicles

Phenocrysts/Clasts:
aphyric to moderately phyric (<1-10%) –
olivine – <1-4% – 1-3 mm – equant –
phenocrysts rare, but increase down section; spinel inclusions present
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

Vesicles: 20-30% – <1-10 mm – sub-rounded – equant–
oxidation
vesicle size highly variable within unit; oxidation greatest at R399-0.3 to R399-0.9 and R399-7.8 to R400-0.3

Alteration: fresh to slightly (<2-10% altered) –
reddish color from vesicle coatings

Veins: none

Fractures: weakly fractured: 7/7.5 ft, from R399-0.3 to R399-7.8, highly fractured to rubbly from R399-7.8 to R400-0.3; red oxidation on rubbly surface

Additional comments:
vesicle fillings: from R399-3.4 to R399-4.6 - some vesicles are filled with euhedral interlocking crystals (plagioclase?), larger vesicles often show evidence of bottom coating by later liquid (marked on photo); NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 177

Contacts: Top (ft): (R 399-8.5-2855.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)

Unit type: aa
rubbly top

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – ~1 mm – equant –
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: 5R 3/4 dusky red– **Structures:** – **Sorting:** –

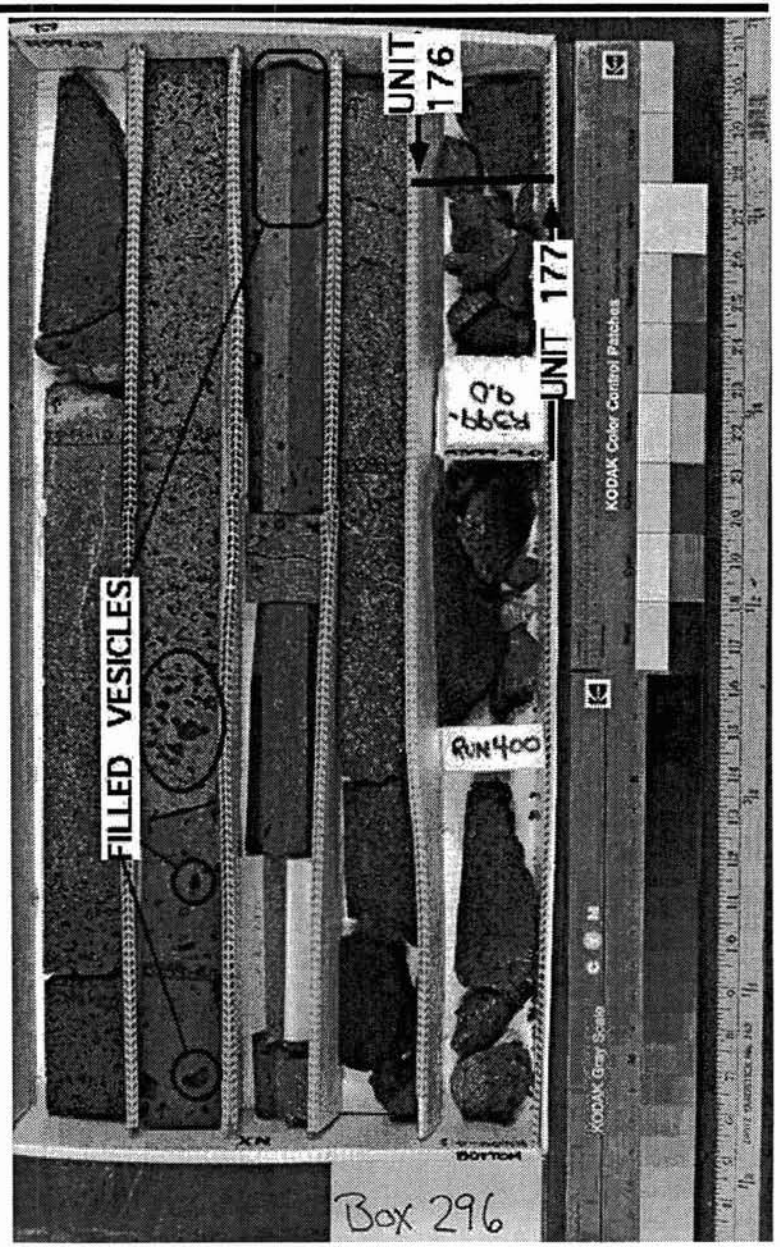
Vesicles: 20-30% – 1-2 mm – sub-rounded – equant–

Alteration: moderately (10-40% altered) –

Veins: none

Fractures: rubble

Additional comments:
aa flow top



Box #: 297

Cores in box: 400

Loggers: LLW
Date logged: 12/5/93
Checked by: MG
Check date: 12/13/93

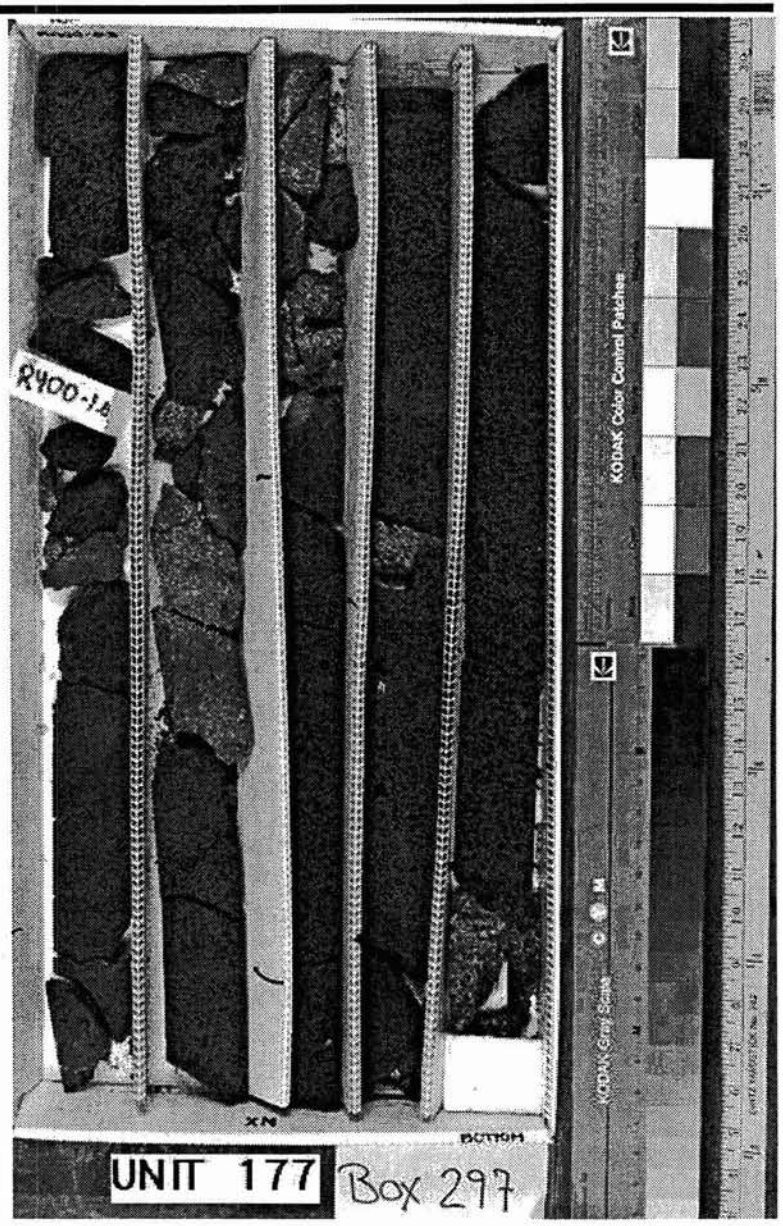
Driller's depth:top [feet]: 2857.7
Driller's depth:bottom [feet]: 2867.0
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:177

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
abundant sub-rounded vesicles; internal contact at R400-7.6 marked by glass
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 2 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 15-30% – 1-4 mm – sub-rounded – equant –
some oxidation
vesicle size increases downcore
Alteration: fresh (<2% altered) –
Veins: none
Fractures: highly; some light to orange clays coating fracture surfaces
Additional comments:
NaCl ppt



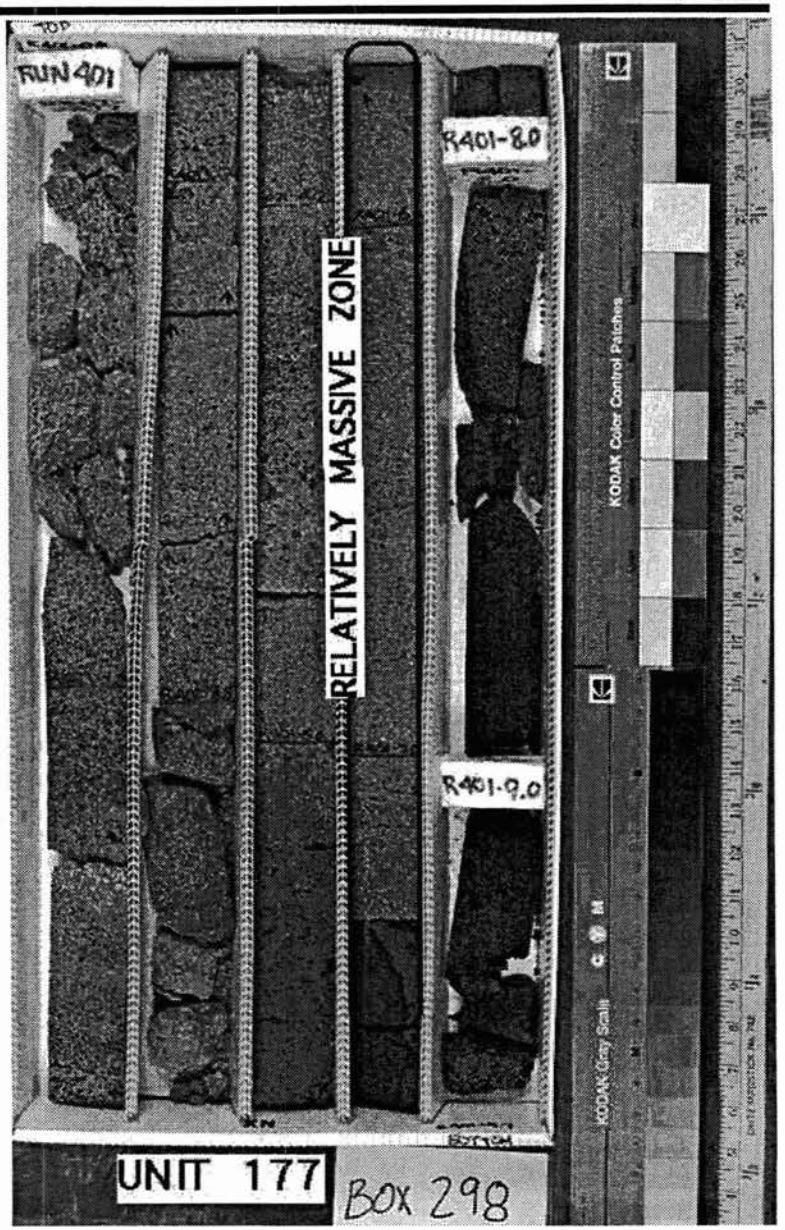
Box #:	Cores in box
298	401

Loggers:	LLW
Date logged:	12/6/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2867.0
Driller's depth:bottom [feet]:	2877.0
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:177**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
abundant sub-rounded vesicles; R401-5.7 to R401-7.5 is more massive
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant – iddingsite
phenocrysts very rare
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – sub-rounded – equant –
yellowish coating @ R401-1.4
~5% in massive zone from R401-5.7 to R401-7.5
Alteration: fresh to moderately (<2-40% altered) – oxidation
moderately from R401-8.7 to R401-9.7
Veins: none
Fractures: highly fractured - R401-0.0 to R401-0.8; weakly fractured - R401-0.8 to R401-9.7 (see photo); some yellowish coatings on fracture surfaces
Additional comments:
minor NaCl ppt



Box #:	Cores in box
299	402 403

Loggers: LLW
Date logged: 12/6/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2877.0
Driller's depth:bottom [feet]: 2889.3
Core type: NQ

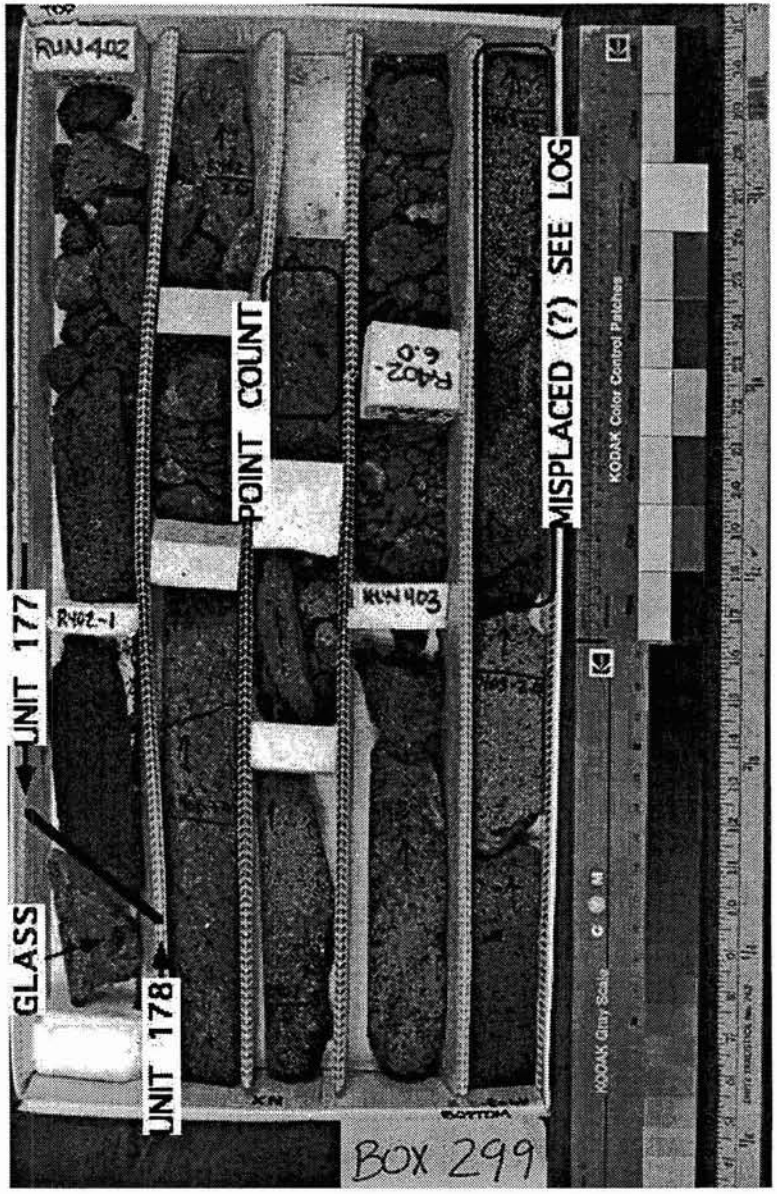
Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 177

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R402-1.7-2878.7')(flow contact)
contact dips ~50°; defined by altered zone with glass clasts and by lithology change
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant – iddingsite
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-4 mm – sub-rounded – equant–
some oxidation
Alteration: slightly (2-10% altered) –
slight groundmass oxidation
Veins: none
Fractures: moderately: 11/1.7 ft; fracture surfaces oxidized
Additional comments:

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 178

Contacts: Top (ft): (R 402-1.7-2878.7')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-5 mm – equant to tabular – iddingsite, oxidation
visual estimate
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded to sub-angular – see comment–
mostly equant; some vertically elongate (R402-3.0 to R402-5.2); one area of horizontally elongate (R403-2.2)
Alteration: fresh to slightly (<2-10% altered) –
one highly altered region @ R403-0.0 to R403-0.3
Veins: none
Fractures: some rubbly zones, otherwise weakly fractured (see photo)
Additional comments:
Note glass clasts at contact. Piece from R403-0.9 to R403-1.9 is more weathered, vesicular and phyric than surrounding unit - misplaced? I don't see an obvious place to put it.



Box #:	Cores in box
300	403 404

Loggers:	LLW
Date logged:	12/6/93
Checked by:	MG
Check date:	12/13/93

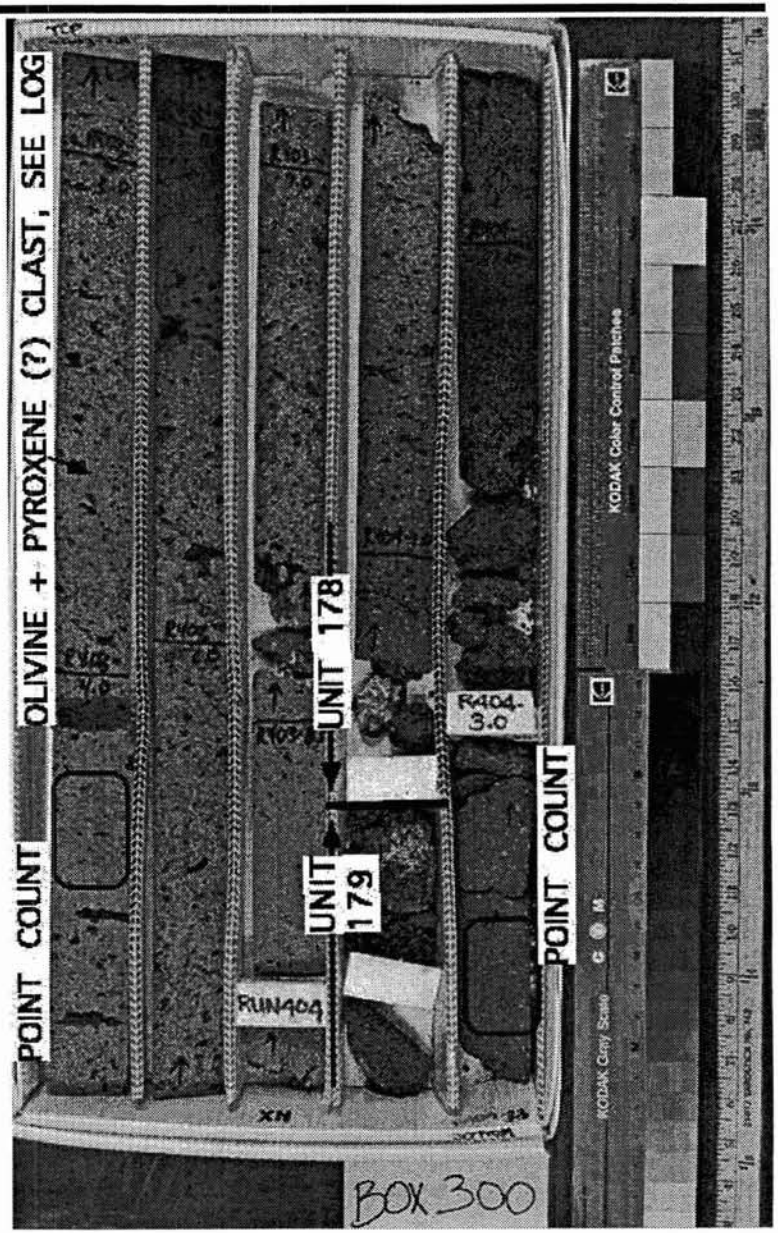
Driller's depth:top [feet]:	2889.3
Driller's depth:bottom [feet]:	2900.5
Core type:	NQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 178

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R404-1.3-2894.8')(flow contact)
contact determined by baked rubbly zone at top of unit 2 and lithologic change
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – iddingsite
11% @ R403-4.3; spinel inclusions present; alteration of phenocrysts minor
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: ~5% – 1-5 mm – sub-rounded – equant to horizontally elongate –
occasional vesicles to >1 cm
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 5/7.3 ft; heavy white coating on fracture at R403-7.9
Additional comments:
NaCl ppt. Some rounded, ~1 cm olivine clasts (dunite); example on back of core at R403-3.6 appears to contain another mineral (pyroxene?) - marked on photo.

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 179

Contacts: Top (ft): (R 404-1.3-2894.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-3 mm – equant to tabular – iddingsite
10-15% @ R404-3.2; some olivines are fresh; towards base spinel inclusions observed
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant –
Alteration: fresh to highly (<2-80% altered) – oxidation
highly altered from R404-1.3 to R404-1.7 grading into fresh flow
Veins: none
Fractures: moderately fractured: ~10/2.2 ft; does not include rubbly zone at top of flow (see photo); some light colored clay on fracture surfaces
Additional comments:
NaCl ppt



Box #:	Cores in box
301	404 405

Loggers:	LLW
Date logged:	12/6/93
Checked by:	MG
Check date:	12/13/93

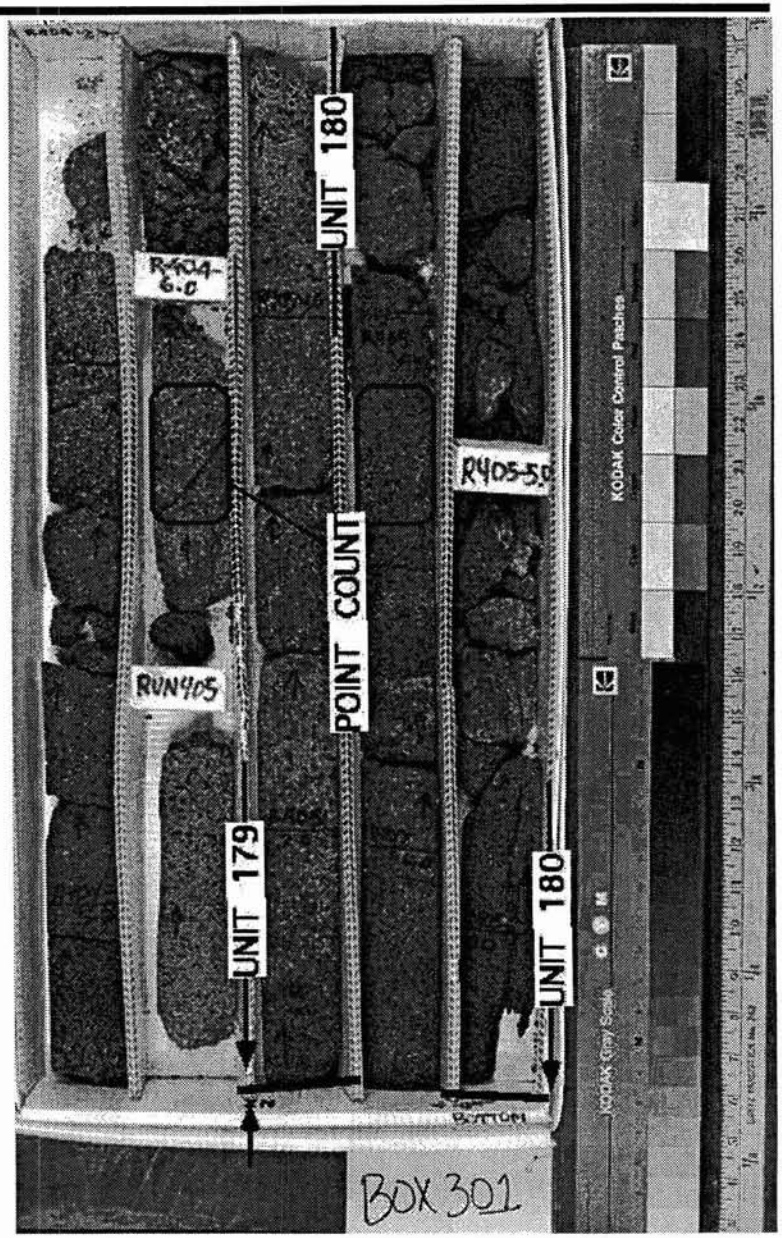
Driller's depth:top [feet]:	2900.5
Driller's depth:bottom [feet]:	2911.9
Core type:	NQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 179

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R405-2.5-2907.5')(flow contact)
contact defined by weathered soil-like zone at base of unit 1; no lithologic change
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-3 mm – equant – iddingsite
14% @ R404-6.3; occasional ~1 cm dunite clasts as described in box 300 log
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded to sub-angular – equant–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly fractured: 12/6 ft; some rubble present at R404-5.7; some fractures have oxidized coatings
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 180

Contacts: Top (ft): (R 405-2.5-2907.5')(flow contact)
Bottom (ft): (R405-6.4-2911.4')(flow contact)
see unit 1 for top contact description
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-5 mm – equant – iddingsite
100 pts @ R405-4.2
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR4/1 brownish gray– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-2 mm – sub-rounded – equant–
Alteration: highly to completely (40-100% altered) –
completely weathered at contact grading into highly oxidized
Veins: none
Fractures: moderate
Additional comments:
NaCl ppt



Box #:	Cores in box
302	405 406

Loggers:	MBB
Date logged:	12/6/93
Checked by:	MG
Check date:	12/13/93

Driller's depth:top [feet]:	2911.9
Driller's depth:bottom [feet]:	2922.7
Core type:	NQ
Units in box:	2

BOX UNIT 1: moderately to highly olivine phyric basalt — UNIT #: 181

Contacts: Top (ft): (R 405-6.4-2911.4')(flow contact at top of box)
Bottom (ft): (R406-1.6-2916.1')(flow contact)
upper contact defined by a highly oxidized/weathered zone followed by a zone of small vesicles that increase in size down section (away from the contact); lower contact defined by a decrease in vesicle size to either side of the contact, an increase in oxidation as well as ropy flow textures

Unit type: pahoehoe
classification based on vesicle morphology and size variation within the flow

Phenocrysts/Clasts:
moderately to highly phyric (2->10%) –
olivine – 7-38% – 1-5 mm – equant –
7% at R405-7.7; 38% at R405-9.0 large variation in abundance suggests flow differentiation; olivines are highly to very highly oxidized/iddingsitized
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: 10R 4/2 + N4 – **Structures:** – **Sorting:** –

Vesicles: 15-40% – <1-5 mm – rounded to subrounded – equant –
some of the vesicles in the center of the flow are 5-10 mm in longest dimension

Alteration: moderately to highly (10-80% altered) –
groundmass oxidation

Veins: none

Fractures: moderately fractured: 17/4.6 ft

Additional comments:
NaCl ppt

BOX UNIT 2: moderately to highly olivine phyric basalt — UNIT #: 182

Contacts: Top (ft): (R 406-1.6-2916.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for contact description; internal flow contact at R406-4.4

Unit type: pahoehoe
classification based on vesicle morphology and size variation with the flow

Phenocrysts/Clasts:
moderately to highly phyric (>10%) –
olivine – 2->10% – 2-3 mm – equant –
22% at R406-3.3; 9% at R406-5.8; flow differentiation? Some olivines have a bladed morphology. Olivines are highly to very highly oxidized and iddingsitized
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 + 10R 3/4 – **Structures:** – **Sorting:** –

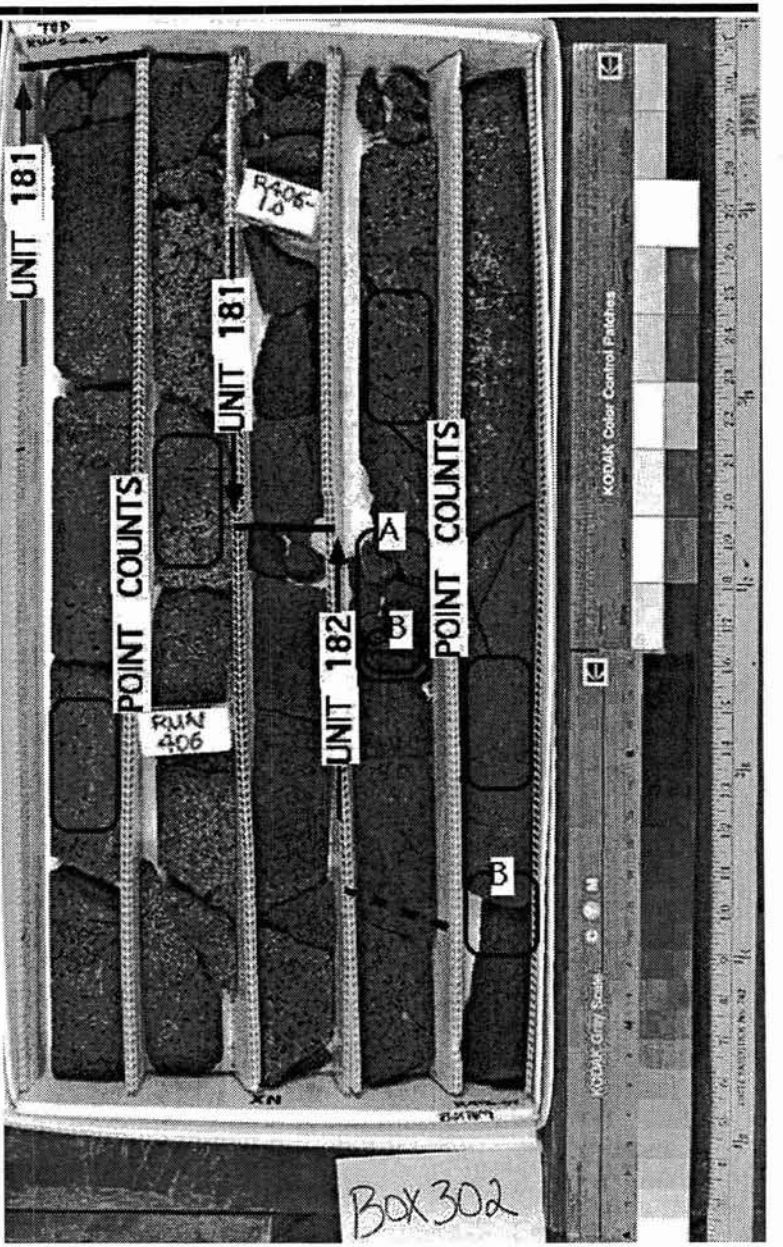
Vesicles: 10-40% – <1-5 mm – subrounded – equant –
some vesicles are elongate; vesicles increase in size and decrease in abundance away from the contact

Alteration: slightly to highly (2-80% altered) –
extent of groundmass oxidation decreases away from the contact; core is only slightly altered by R406-3.0; there are thin oxidized zones labeled "B" on the photo; basalt surfaces in the vesicles are oxidized

Veins: none

Fractures: weakly fractured: 10/4.7 ft, doesn't include rubbly zone labeled "A" on the photo

Additional comments:
NaCl ppt



Box #: 303

Cores in box
406
407

Loggers: GFE
Date logged: 12/6/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2922.7
Driller's depth:bottom [feet]: 2932.6
Core type: NQ

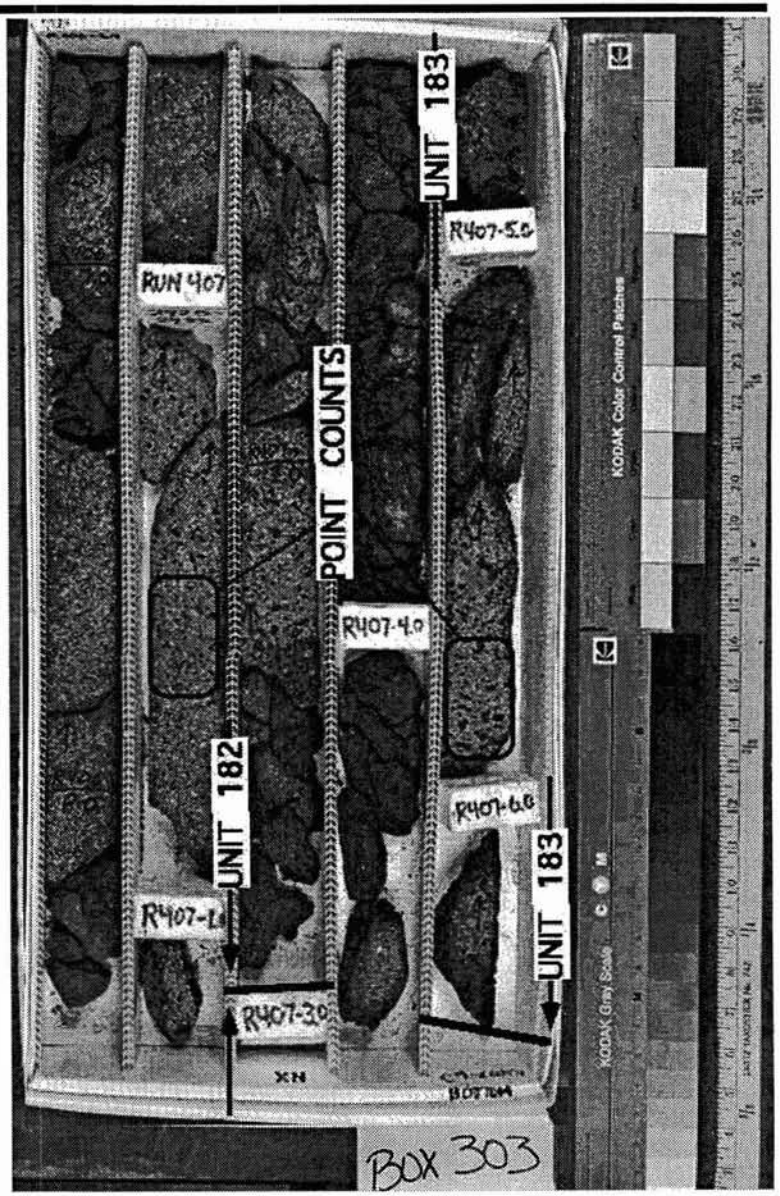
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 182

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R407-3.0-2926.5')(flow contact)
no apparent lithology change; red baked rubble zone at base
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – blocky (<3:1:1) – oxidized
Olivine crystals are very oxidized and black in color.
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant–
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: sparsely fractured
Additional comments:
NaCl around olivine crystals

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 183

Contacts: Top (ft): (R 407-3.0-2926.5')(flow contact)
Bottom (ft): (R407-6.3-2929.8')(flow contact)
no apparent lithologic change; red rubble zone at base
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – blocky (<3:1:1) – oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 3/4 dusky red– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 5 mm – sub-rounded – equant–
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: sparsely fractured
Additional comments:



Box #: 304

Cores in box
407
408

Loggers: LLW
Date logged: 12/6/93
Checked by: MG
Check date: 12/13/93

Driller's depth:top [feet]: 2932.6
Driller's depth:bottom [feet]: 2942.4
Core type: NQ

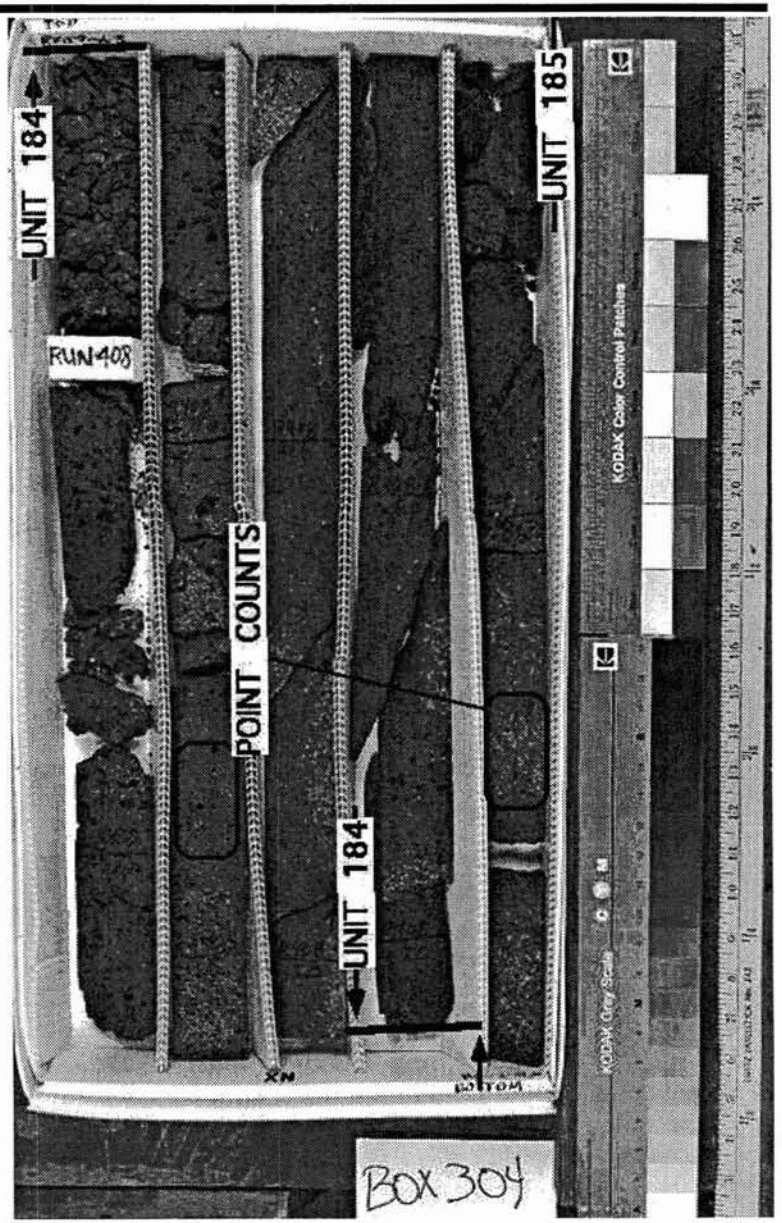
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 184

Contacts: Top (ft): (R 407-6.3-2929.8')(flow contact)
Bottom (ft): (R408-7.2-2940.2')(flow contact)
contact defined by small vesicles, baked zone and slight lithologic change
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to tabular – oxidation
16% @ R408-2.7; most olivine completely black
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5R 3/4 dusky red – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1 to 10 mm – sub-rounded to sub-angular – equant – oxidation
some vesicles vertically elongate; vesicle size grades steadily from largest @ R408-0.0 getting smaller down flow
Alteration: moderately (10-40% altered) –
some fresher areas
Veins: none
Fractures: rubbly: R407-6.3 to R408-0.0; weakly otherwise: ~13/7 ft; fractures oxidized
Additional comments:

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 185

Contacts: Top (ft): (R 408-7.2-2940.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – iddingsite, oxidized
12% @ R406-8.5; most olivine completely black
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dark gray to 10R3/4 dark reddish brown – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – equant – oxidation
vesicles smallest at top of unit
Alteration: slightly to very highly (2-95% altered) –
very highly altered at top of flow to slightly altered at end of box
Veins: none
Fractures: highly at top of unit grading to weakly at end of box (see photo)
Additional comments:
NaCl ppt



Box #: 305

Cores in box
408
409

Loggers: LLW
Date logged: 12/7/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 2942.4
Driller's depth:bottom [feet]: 2953.0
Core type: NQ

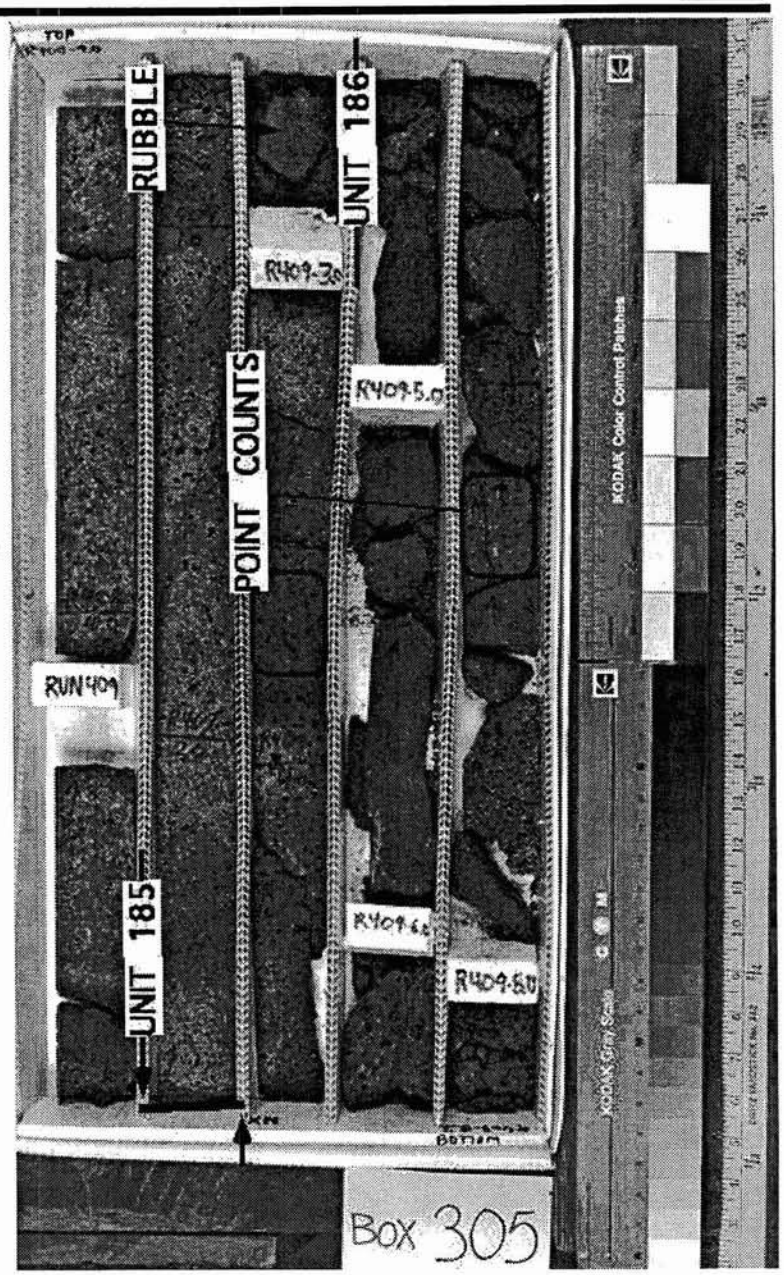
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 185

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R409-2.7-2945.8')(flow contact)
contact defined by totally weathered soil-like top to unit 2 - may be just an internal flow contact
Unit type: pahoehoe
abundant sub-rounded to sub-angular vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 2 mm – equant – highly oxidized
visual estimate; blackened olivines
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded to sub-angular – equant –
oxidation
occasional vesicles to 1 cm
Alteration: slightly (2-10% altered) –
groundmass oxidation
Veins: none
Fractures: weakly: 2/4 ft - excludes small rubble zone at R409-0.8 (marked on photo); fractures heavily oxidized
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 186

Contacts: Top (ft): (R 409-2.7-2945.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: pahoehoe
abundant, variable-sized, sub-rounded vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – highly oxidized
15% @ R409-3.8; 14% @ R409-7.4
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray to 10R3/4 dark reddish brown – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – equant –
highly oxidized
vesicle size is highly variable in different pieces
Alteration: moderately to highly (10-80% altered) –
groundmass oxidation
Veins: none
Fractures: moderate to highly (see photo); fracture surfaces highly oxidized
Additional comments:



Box #:	Cores in box
306	409 410 411

Loggers:	LLW
Date logged:	12-7-93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	2953.0
Driller's depth:bottom [feet]:	2971.9
Core type:	NQ
Units in box:	3

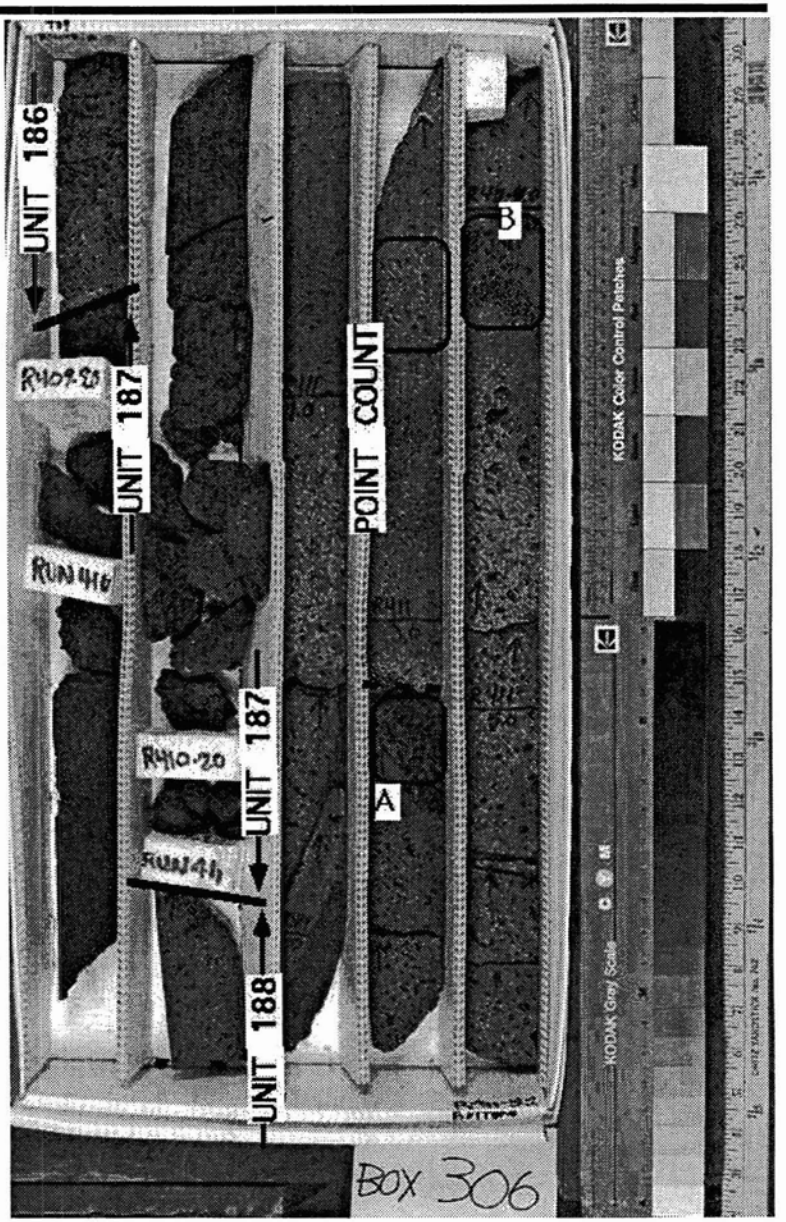
BOX UNIT 1: highly olivine phyric basalt **UNIT #: 186**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R409-8.9-2952.0')(flow contact)
contact defined by vesicle size gradation and change in degree of weathering; no lithology change (uncertain contact)
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant to tabular – highly oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant –
oxidation
vesicle size grades down to smallest near flow contact
Alteration: moderately (10-40% altered) –
groundmass oxidation; contact region most highly oxidized
Veins:
Fractures: moderate: 3/0.7 ft
Additional comments:

BOX UNIT 2: highly olivine phyric basalt **UNIT #: 187**

Contacts: Top (ft): (R 409-8.9-2952.0')(flow contact)
Bottom (ft): (R411-0.0-2965.0')(flow contact)
considerable core loss, lithology change at R411
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – iddingsite, oxidation
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray to 10R3/4 dark reddish brown – **Structures:** – **Sorting:** –
Vesicles: ~5% – 1-3 mm – sub-angular – equant –
oxidation
Alteration: moderately to very highly (10-95% altered) –
most altered at contact
Veins: none
Fractures: highly fractured - see photo
Additional comments:

BOX 306 CONTINUED ON NEXT PAGE



Box #:	Cores in box
306	409 410 411

Loggers: LLW
Date logged: 12-7-93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 2953.0
Driller's depth:bottom [feet]: 2971.9
Core type: NQ

Units in box: 3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 188

Contacts: Top (ft): (R 411-0.0-2965.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 2 for description of top contact; distinct lithologic change

Unit type: massive

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – iddingsite, oxidation
17% @ R411-2.4; phenocrysts moderate to highly oxidized
plagioclase – <<1% – ~1 mm – tabular (>3:1:1) –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 med. dark gray to 5YR2/2 dusky brown – **Structures:** – **Sorting:** –

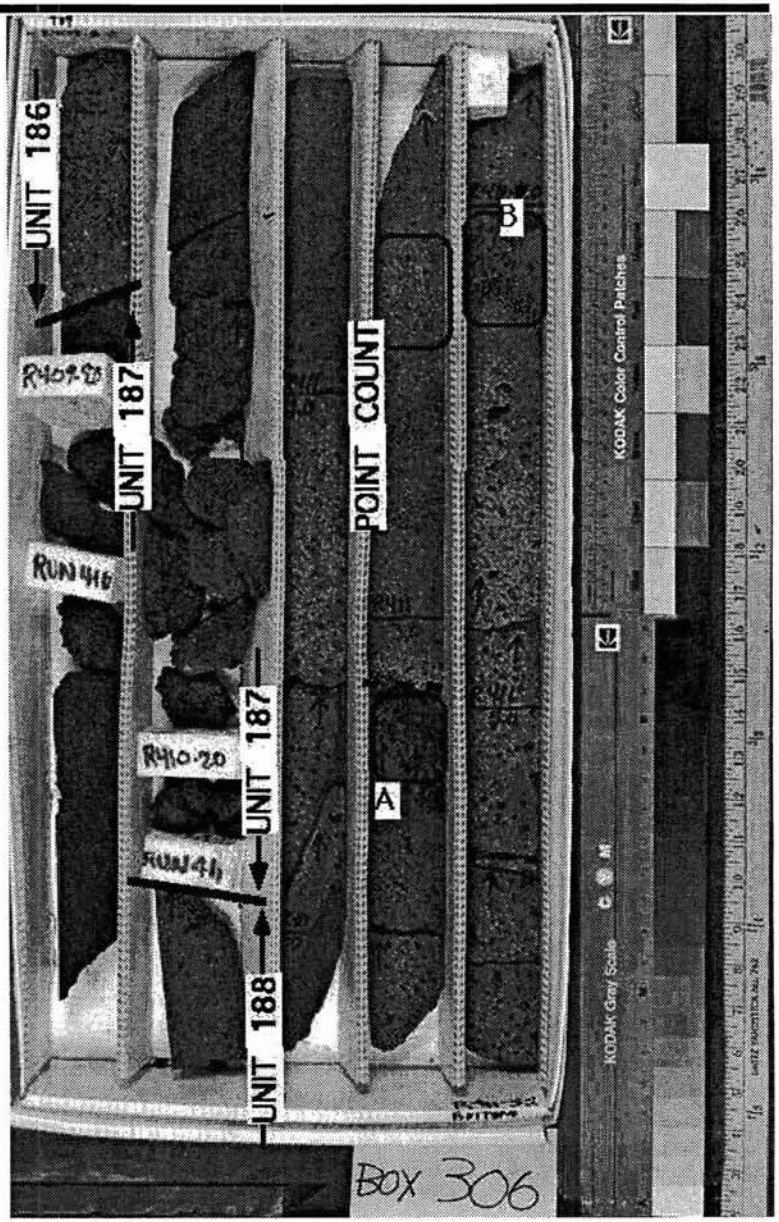
Vesicles: ~5% – <1-5 mm – sub-rounded to sub-angular – equant –
oxidation
occasional elongate vesicles with no preferred orientation; highly vesicular zone at R411-4.1 to 4.2 marked "B" on photo

Alteration: moderately (10-40% altered) –
groundmass oxidation

Veins: none

Fractures: weakly fractured: 12/5.2 ft; fractured surfaces have oxidized coatings

Additional comments:
R411-3.2 - internal cemented rubbly zone (marked "A" on photo), possible internal flow contact??



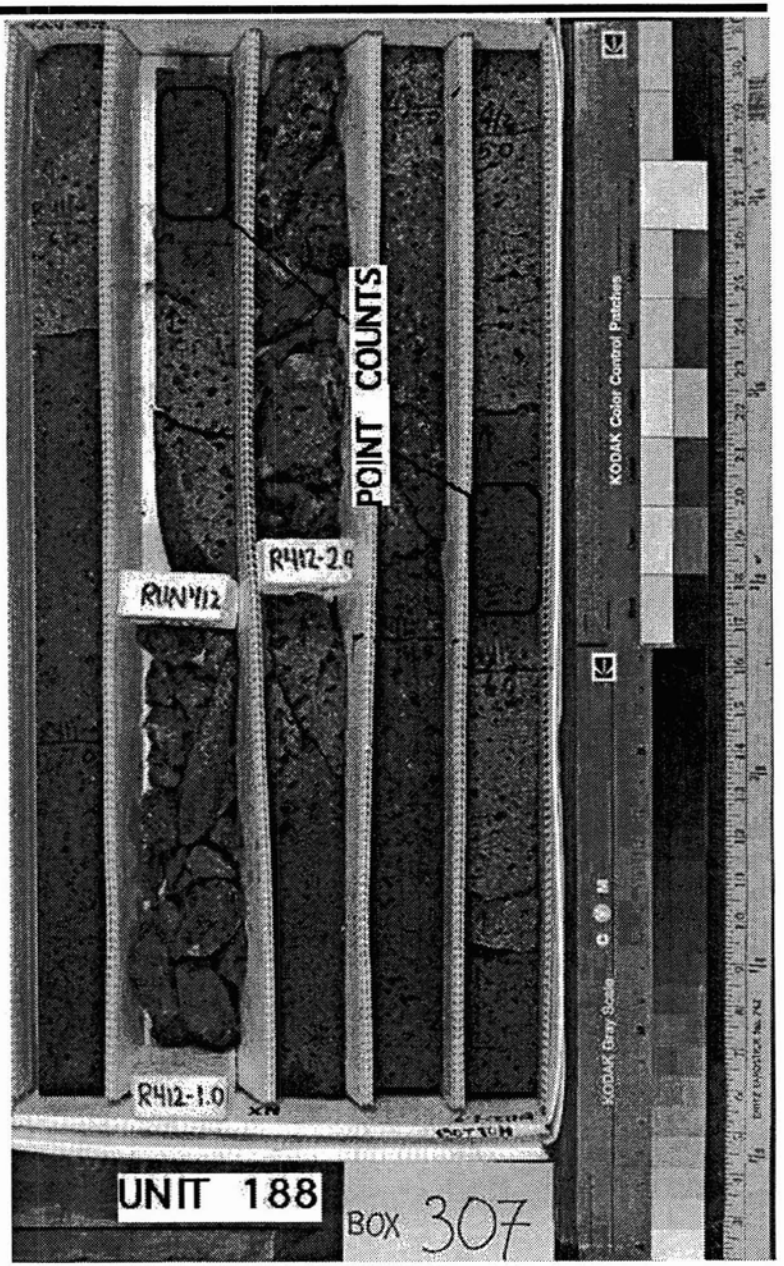
Box #:	Cores in box
307	411 412

Loggers:	MBB
Date logged:	12/7/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	2971.9
Driller's depth:bottom [feet]:	2983.8
Core type:	NQ
Units in box:	1

BOX UNIT 1: highly olivine phyric basalt **UNIT #:188**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: transitional
classification based on the presence of both sheared and equant vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-18% – 2-4 mm – equant to tabular –
15% at R411-7.8; 18% at R412-5.8; spinel inclusions in the olivine; some bladed olivines; olivines are moderately to highly oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 + 5R 3/4 – **Structures:** – **Sorting:** –
Vesicles: 7-10% – 1-5 mm – subrounded to subangular – equant to horizontally elongate–
horizontally elongate vesicles are developed below R412-4.0; basalt is oxidized within the vesicles
Alteration: moderately (10-40% altered) –
Extent of groundmass oxidation decreases lightly below R412-5.0.
Veins: none
Fractures: weakly fractured: 9/7.8 ft; measurement doesn't include 2' rubble zone starting at R412-0.0; groundmass is more oxidized along fracture surfaces
Additional comments:
NaCl ppt. No plagioclase!?



Box #: 308

Cores in box
412
413
416

Loggers: MBB
Date logged: 12/7/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 2983.8
Driller's depth:bottom [feet]: 3001.0
Core type: NQ

Units in box: 3

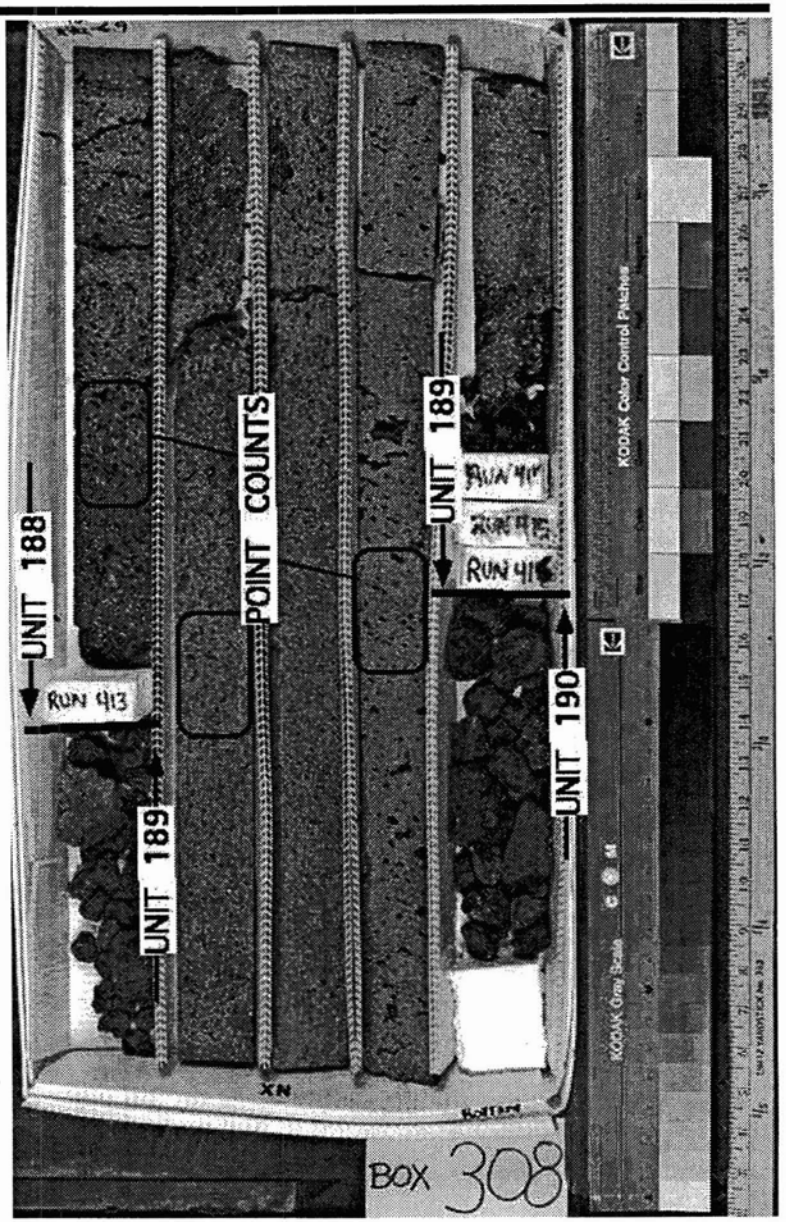
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 188

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R413-0.0-**2985.0**')(flow contact)
flow contact defined by clinkery zone at the top of the bottom flow, and a decrease in vesicle size, and an increase in vesicularity in the upper flow
Unit type: transitional
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 18% – 2-4 mm – equant –
18% at R412-7.7; spinel inclusions in the olivine phenocrysts; olivines occur in crystal clots and sometimes have a bladed morphology (bladed olivines more abundant near the contact); olivines are slightly oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 + 5R 3/4 – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1-5 mm – subrounded to subangular – equant to elongate –
size decreases and abundance increases toward contact
Alteration: moderately to highly (10-80% altered) –
Extent of groundmass oxidation increases toward contact.
Veins: none
Fractures: weakly fractured: 3/1.2 ft; groundmass more oxidized at the fractures
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 189

Contacts: Top (ft): (R 413-0.0-**2985.0**')(flow contact)
Bottom (ft): (R416-0.0-**2995.0**')(flow contact)
see unit 1 for upper contact description; poor recovery in R416 masks contact; recovered material is oxidized and clinkery
Unit type: aa
classification based on the angular and elongate shape of the vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-16% – 2-4 mm – equant to tabular –
16% at R413-1.6; 10% at R413-5.6; rare spinel inclusions in the olivines; olivine crystal clots are present; olivines are fresh to slightly oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 3-5% – <1-5 mm – subrounded to angular – equant to elongate –
Equant vesicles are generally ≤2 mm; larger vesicles are horizontally elongate.
Alteration: fresh to highly (<2-80% altered) –
Extent of groundmass oxidation decreases away from the upper contact; core is fresh by R413-2.0.
Veins: none
Fractures: weakly fractured: 3/6 ft
Additional comments:
minor NaCl ppt

BOX 308 CONTINUED ON NEXT PAGE



Box #:	Cores in box
308	412 413 416

Loggers:	MBB
Date logged:	12/7/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	2983.8
Driller's depth:bottom [feet]:	3001.0
Core type:	NQ
Units in box:	3

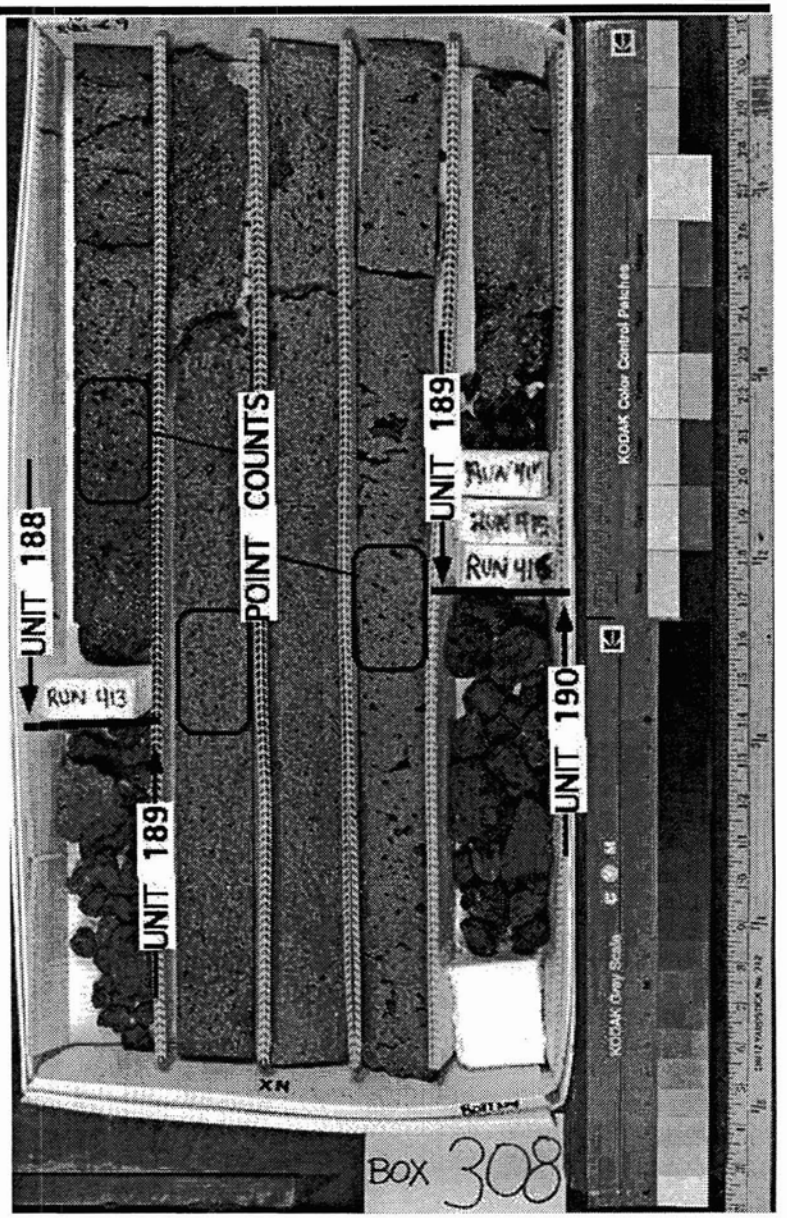
BOX UNIT 3: moderately olivine phyric **UNIT #: 190**

Contacts: Top (ft): (R 416-0.0-2995.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 2 for contact description

Unit type: rubble
some of this material may be cave (size range of olivines varies dramatically among some of the pieces); most of the pieces are clinkery

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 5-10% – 1-3 mm – equant –
visual estimate of mode; olivines are slightly oxidized
– – – –
– – – –

Groundmass/Matrix: microcrystalline –
Color: – **Structures:** – **Sorting:** –
Vesicles: 5-15% – <1-4 mm – subrounded to subangular – equant to elongate –
Alteration: moderately to very highly (10-95% altered) –
groundmass oxidation
Veins: none
Fractures: rubbly
Additional comments:



Box #: 309

Cores in box: 417

Loggers: GFE, MG
Date logged: 12/7/93
Checked by: MG
Check date: 12/14/93

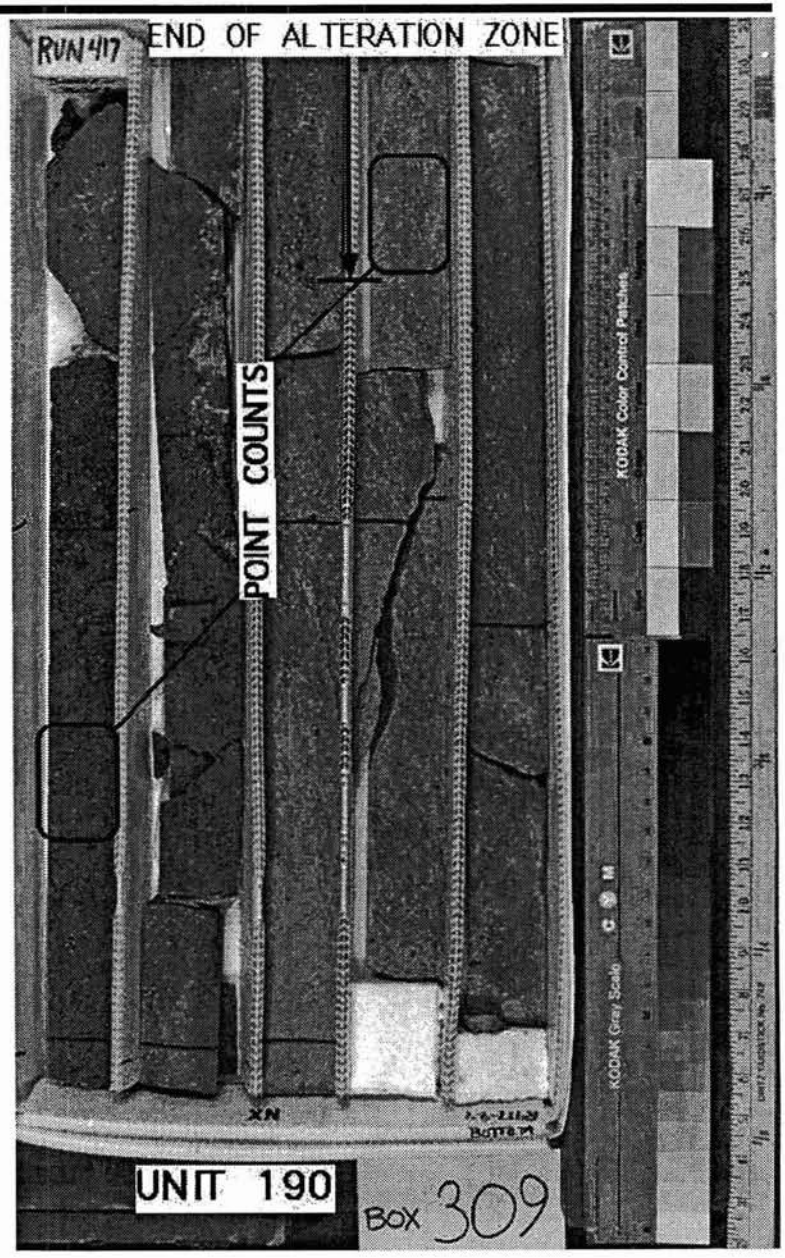
Driller's depth:top [feet]: 3001.0
Driller's depth:bottom [feet]: 3010.5
Core type: NQ

Units in box: 1

BOX UNIT 1: moderately phyric olivine basalt

UNIT #:190

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
upper part oxidized rubble
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 4% – 1-5 mm – blocky (<3:1:1) –
slightly more phyric in the altered zone
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N6 gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1 mm – sub-rounded – equant –
Alteration: moderately (10-40% altered) –
Zone of alteration runs from R417-0.0 to R417-4.4, after which the flow is fresh.
Veins: none
Fractures: weakly: 10/10 ft
Additional comments:
NaCl ppt



Box #:	Cores in box
310	417 418

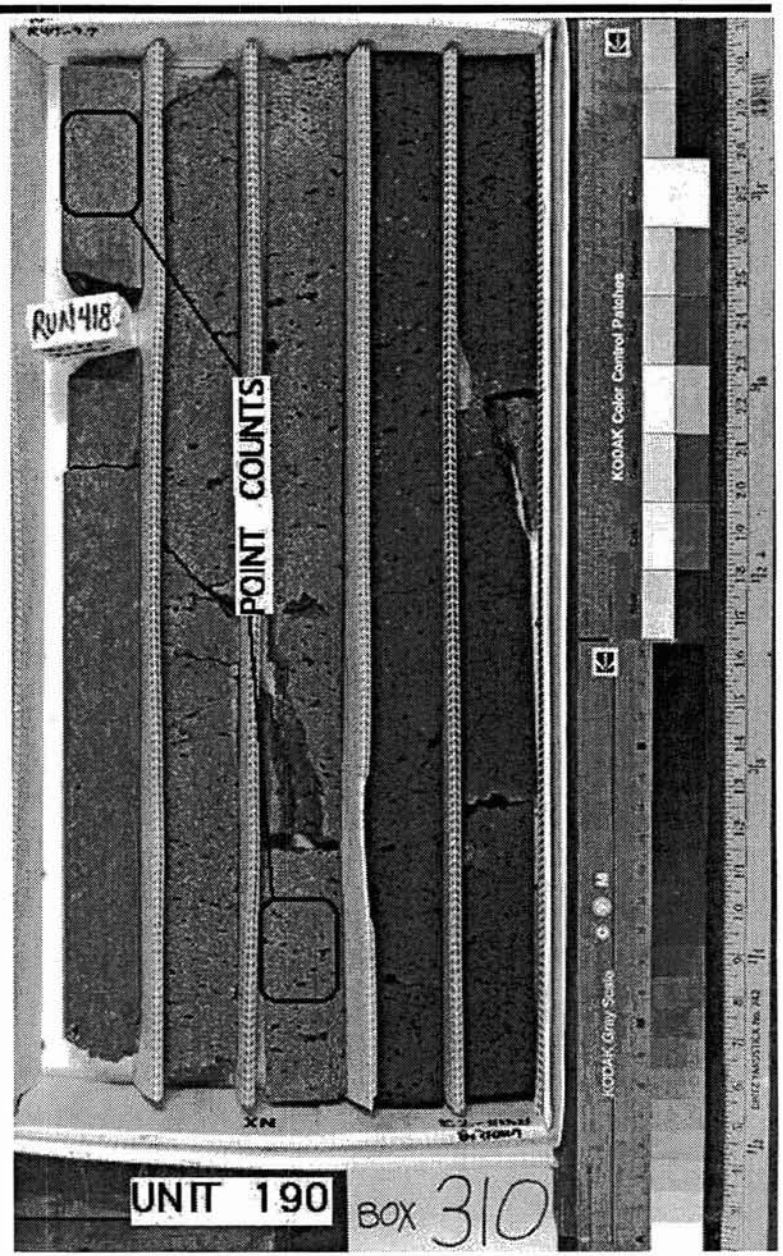
Loggers:	GFE, MG
Date logged:	12/7/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3010.5
Driller's depth:bottom [feet]:	3019.9
Core type:	NQ
Units in box:	1

BOX UNIT 1: moderately olivine phyric basalt

UNIT #:190

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
From R418-1.4 flow is aa, but the flow previous to this is massive.
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 3-4% – 1-5 mm – blocky (<3:1:1) –
100 pts counted @ R418-1.0 (MG)
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N6 gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated–
flow less vesicular above R418-1.3 (<5%)
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 8/10 ft
Additional comments:
NaCl ppt



Box #: 311

Cores in box
418
419

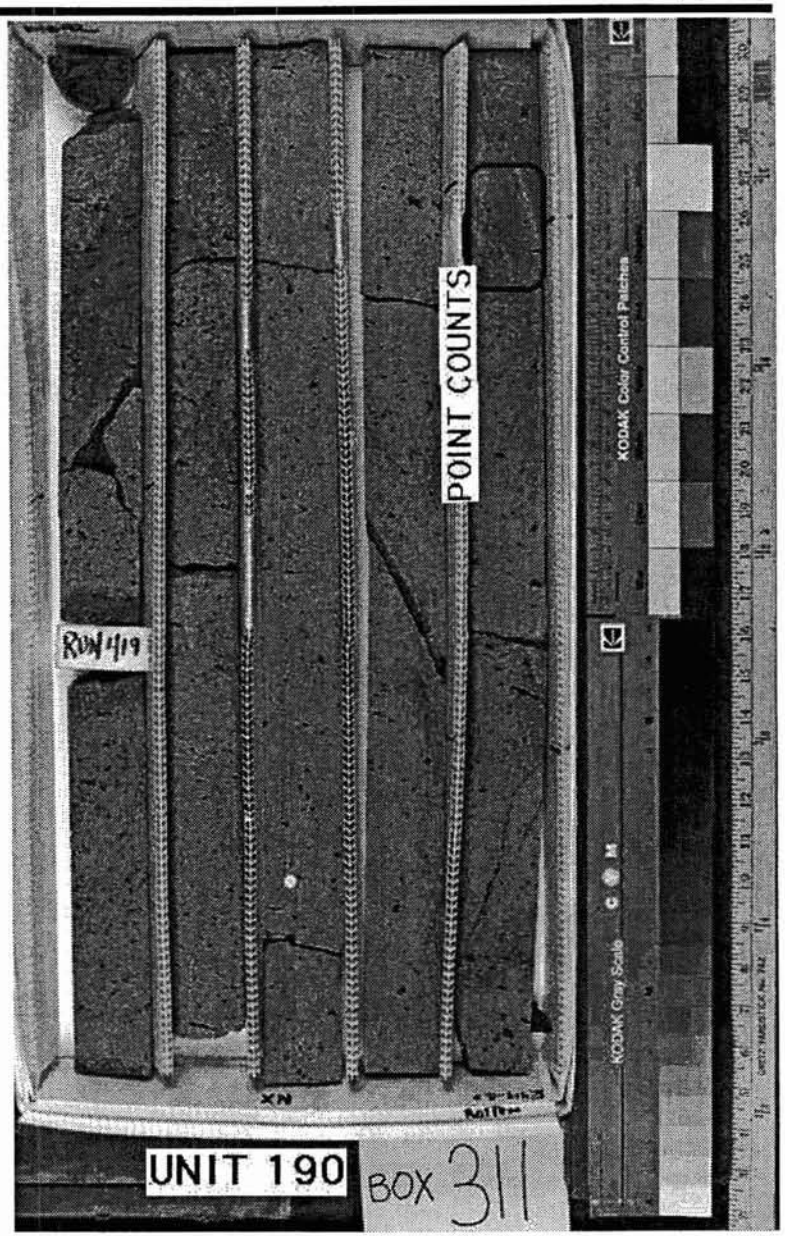
Loggers: GFE, MG
Date logged: 12/7/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3019.9
Driller's depth:bottom [feet]: 3029.6
Core type: NQ

Units in box: 1

BOX UNIT 1: moderately phyric olivine basalt **UNIT #:190**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 3% – 1-5 mm – blocky (<3:1:1) –
Spinel inclusions in the olivine. Some of the larger olivine crystals tend to be more tabular in shape; 100 pts counted at R419-5.0 (?).
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N6 gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-3 mm – sub-rounded – horizontally elongated –
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: weakly fractured: 8/10 ft
Additional comments:
NaCl ppt. Fracture surfaces show some filamentous clay(?) coatings.



Box #: 312

Cores in box
419
420

Loggers:	GFE, MBB
Date logged:	12/7/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3029.6
Driller's depth:bottom [feet]:	3038.5
Core type:	NQ
Units in box:	3

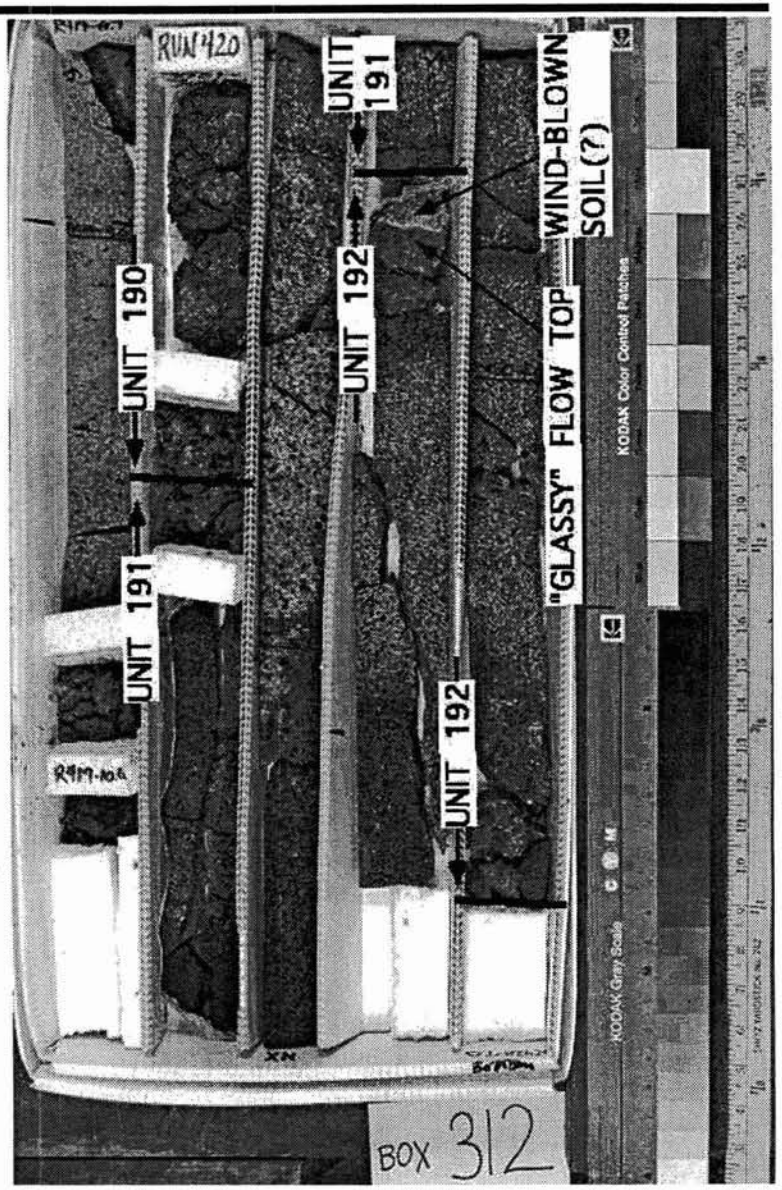
BOX UNIT 1: moderately phyric olivine basalt — UNIT #: 190

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R420-0.8-3032.4')(flow contact)
Unit type: aa
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 3% – 1-5 mm – blocky (<3:1:1) –
Some of the larger olivine crystals tend to be tabular.
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: 5R 2/ blackish red – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 2/1.1; lowermost 0.9' is rubbly.
Additional comments:
Minor NaCl ppt.

BOX UNIT 2: aphyric basalt — UNIT #: 191

Contacts: Top (ft): (R 420-0.8-3032.4')(flow contact)
Bottom (ft): (R420-4.1-3035.7')(flow contact)
base of flow marked by glass and soil
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N6 gray – **Structures:** – **Sorting:** –
Vesicles: 7% – 5 mm – spherical – equant –
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt

BOX 312 CONTINUED ON NEXT PAGE



Box #:	Cores in box
312	419 420

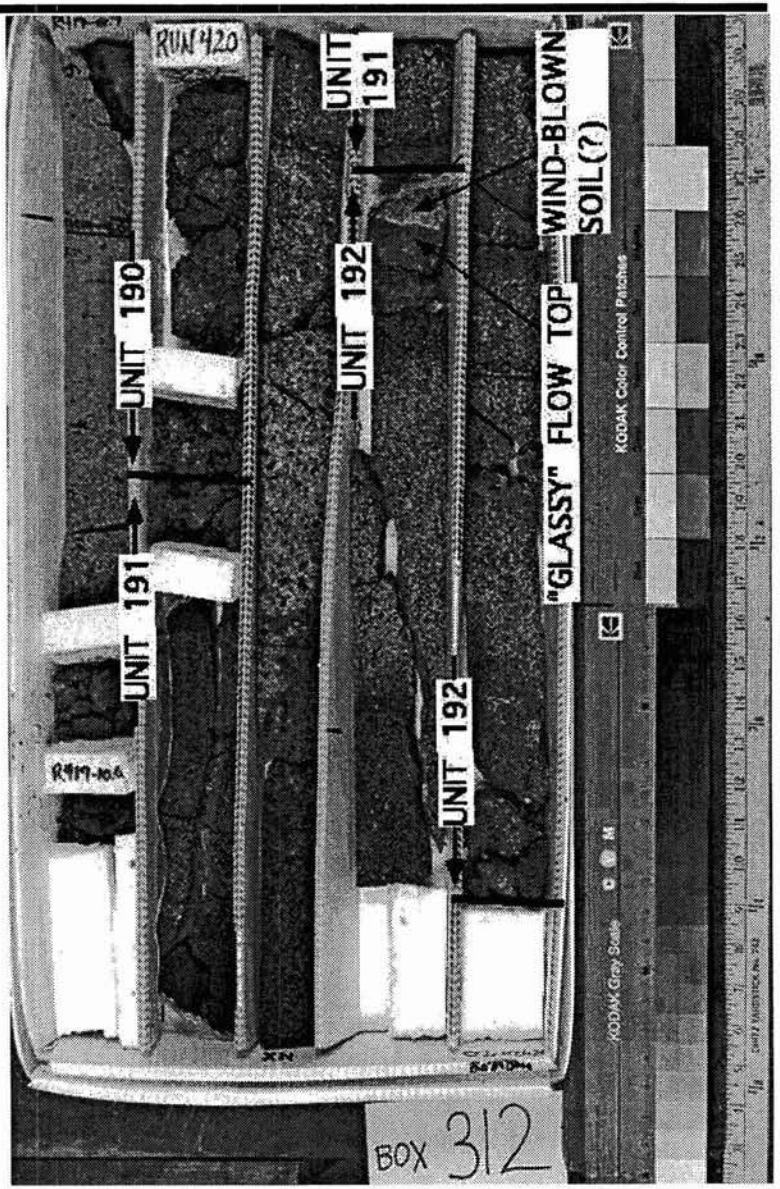
Loggers:	GFE, MBB
Date logged:	12/7/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3029.6
Driller's depth:bottom [feet]:	3038.5
Core type:	NQ
Units in box:	3

BOX UNIT 3: aphyric basalt

UNIT #:192

Contacts: Top (ft): (R 420-4.1-3035.7')(flow contact)
Bottom (ft): (R420-7.0-3038.6')(flow contact)
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N6 gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 3 mm – spherical – equant–
Alteration: fresh (<2% altered) –
Contact zone is moderate to highly altered.
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt. The top flow contact is sharp, with a baked layer of ash/soil (~3 cm thick) overlying a glassy flow top. This is followed by ~2 cm of altered pahoehoe with equant vesicles averaging 1 mm in size. Below the thin layer of pahoehoe, there is a light gray, unbaked layer of volcaniclastic soil(?) ~2 cm thick. This second layer is possibly ash that was deposited in a crack in the top of the main body of the flow. Glass, fluid-type contact at base of box.



Box #:	Cores in box
313	420 421

Loggers:	MBB
Date logged:	12/8/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3038.5
Driller's depth:bottom [feet]:	3047.8
Core type:	NQ
Units in box:	3

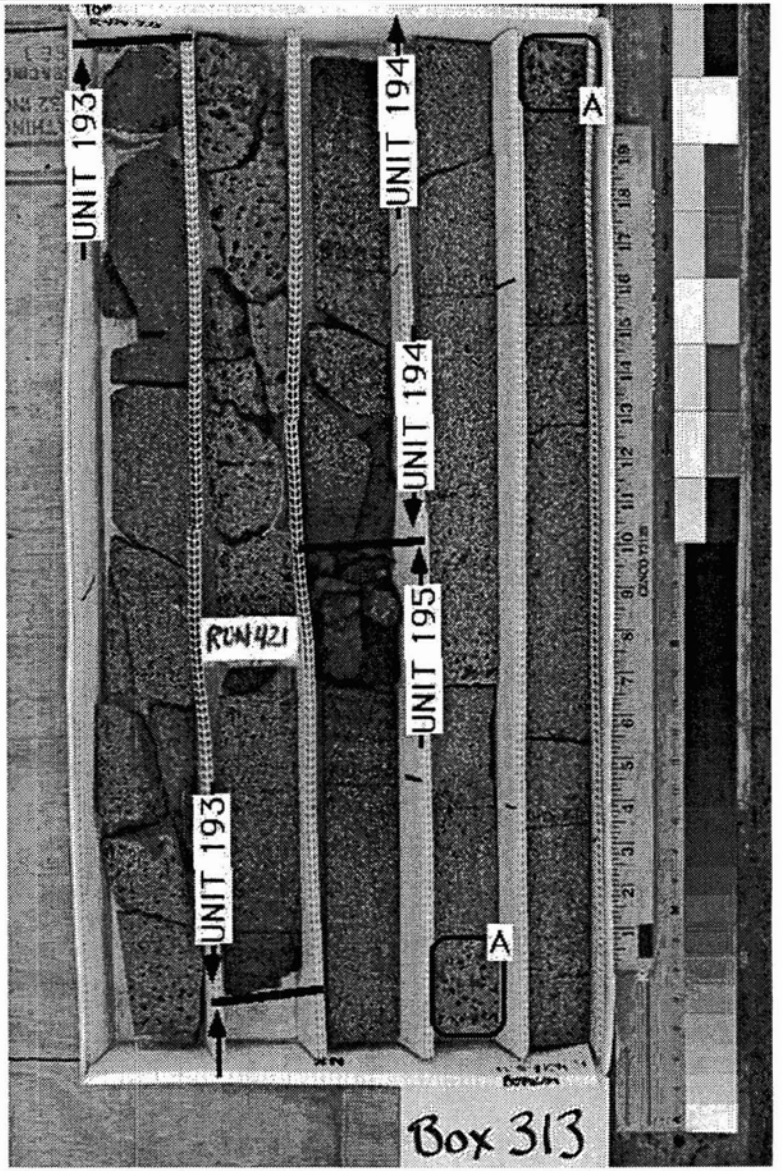
BOX UNIT 1: aphyric basalt — UNIT #: 193

Contacts: Top (ft): (R 420-7.0-3038.6')(flow contact)
Bottom (ft): (R421-0.6-3042.2')(flow contact)
top flow contact defined by a highly vesicular/weathered zone at the top of the lower flow; lower contact defined by a decrease in vesicle size (no lithology change); top contact is not baked
Unit type: pahoehoe
vesicle morphology and size variation within flow
Phenocrysts/Clasts:
aphyric (<1%) – rare olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 15-40% – <1-5 mm – sub-rounded to sub-angular – equant –
<<1 mm vesicles in the region of large vesicles; these small vesicles are regions of minor oxidation. Some vesicles in the center of the flow are >10 mm in largest dimension; some horizontally elongate vesicles in center of flow
Alteration: fresh to slightly (<2-10% altered) –
right at the top of contact the alteration/weathering is more pervasive; 2 cm thick oxidized zone at the bottom of the flow
Veins: none
Fractures: moderately fractured: 17/3.8 ft; dusting of ivory-colored material on some of the fractured surfaces
Additional comments:
minor NaCl ppt; some plagioclase laths in the groundmass are observable with hand lens

BOX UNIT 2: aphyric basalt — UNIT #: 194

Contacts: Top (ft): (R 421-0.6-3042.2')(flow contact)
Bottom (ft): (R421-1.5-3043.1')(flow contact)
see unit 1 for contact description; could be internal unit
Unit type: pahoehoe
vesicles morphology & size variation within flow units, no lithology change
Phenocrysts/Clasts:
aphyric (<1%) – rare olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-50% – <1-5 mm – sub-rounded to sub-angular – equant –
basalt within vesicles is oxidized
Alteration: slightly (2-10% altered) –
highly oxidized with ~1 cm of the upper & lower contact
Veins: none
Fractures: moderately fractured: 4/1 ft; most fractures located in the contact zone (see photo)
Additional comments:
minor NaCl ppt; some plagioclase laths are observed in groundmass with hand lens

BOX 313 CONTINUED ON NEXT PAGE



Box #: 313

Cores in box
420
421

Loggers: MBB
Date logged: 12/8/93
Checked by: MG
Check date: 12/14/93

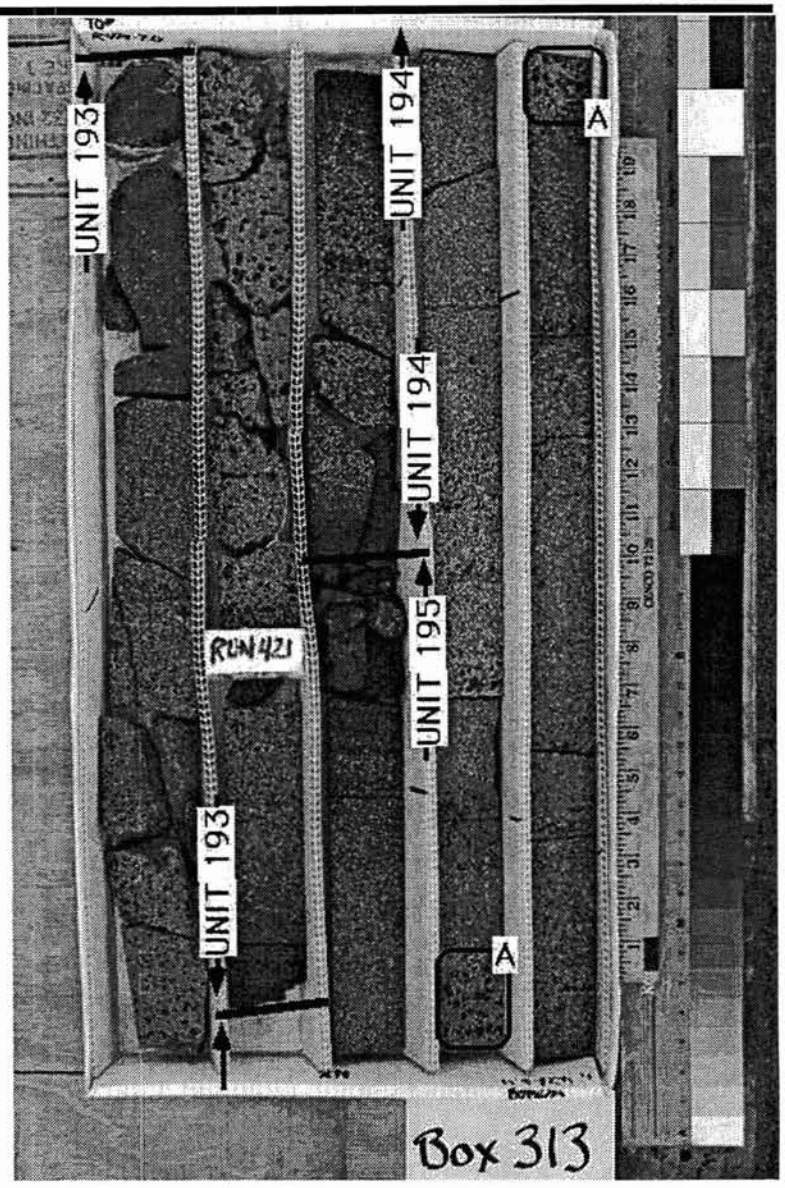
Driller's depth:top [feet]: 3038.5
Driller's depth:bottom [feet]: 3047.8
Core type: NQ

Units in box: 3

BOX UNIT 3: aphyric basalt

UNIT #: 195

Contacts: Top (ft): (R 421-1.5-3043.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 2 description
Unit type: transitional
classification based on higher fraction of elongate more angular vesicles
Phenocrysts/Clasts:
aphyric (<1%) – olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-50% – 1-3 mm – sub-rounded – equant–
narrow zones of <5% vesicles
Alteration: fresh (<2% altered) –
groundmass highly oxidized right at contact
Veins: none
Fractures: weakly fractured: 9/5 ft
Additional comments:
NaCl ppt; plagioclase visible in groundmass with hand lens; "A" = regions of vesicle infillings - darker more coarsely crystalline areas with vesicle outlines



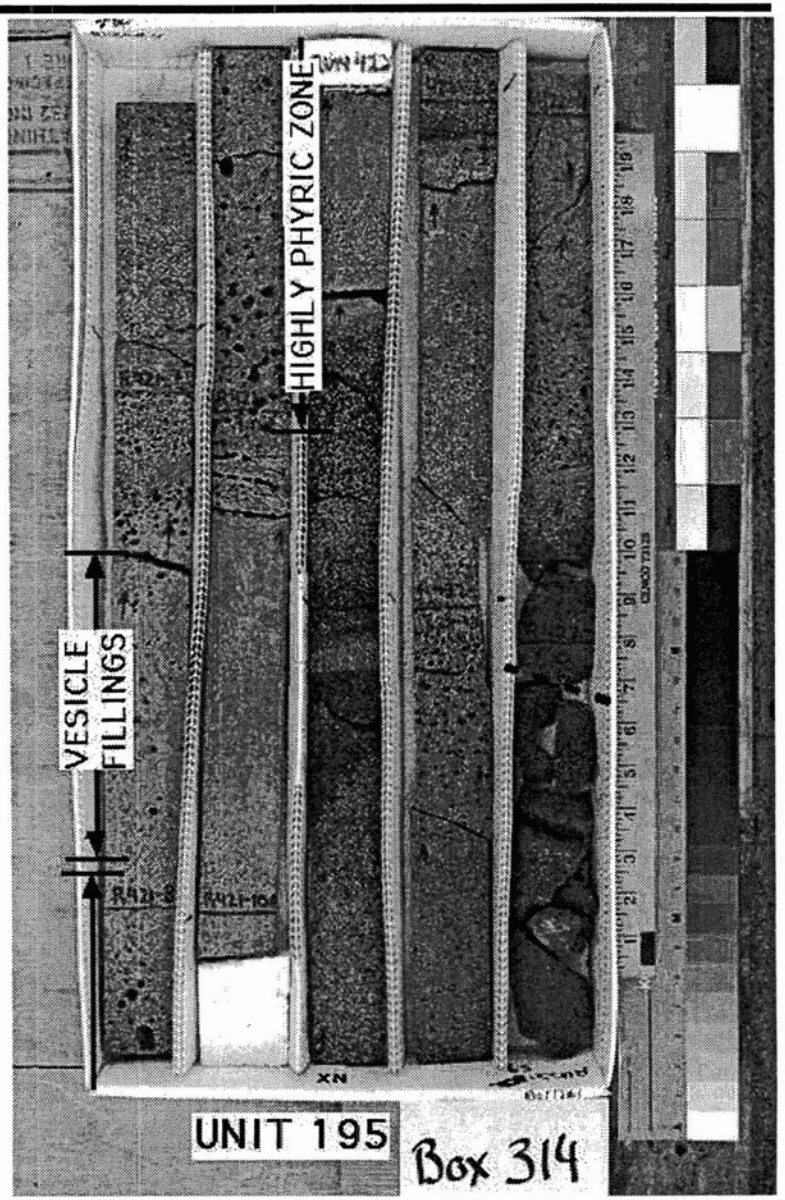
Box #:	Cores in box
314	421 422

Loggers:	LLW
Date logged:	12/8/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3047.8
Driller's depth:bottom [feet]:	3057.7
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:195**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-5 mm – equant –
Aphyric except for highly phyric zone from R421-7.8 to R421-9.0 (14%@ R421-7.9); mineral settling!
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray (fresh) – **Structures:** – **Sorting:** –
Vesicles: 5-30% – <1-5 mm – sub-rounded – equant–
oxidation
occasional horizontally elongate vesicles, vesicle size changes throughout section, may indicate other internal flow contacts
Alteration: fresh to highly (<2-80% altered) –
mostly fresh; highly oxidized below internal flow contact at R422-5.1
Veins: none
Fractures: weakly fractured: 15/8.5 ft - does not include highly fractured zone from R422-5.1 to R422-5.9; fractures coated with yellowish clays
Additional comments:
from R421-7.2 to R421-8.1 some vesicles are partially to completely filled with a magnetic mixture of dark (hematite?) and light mineral; internal flow contact at ~R422-5.1



Box #: 315

Cores in box
422
423

Loggers:	GFE, MG
Date logged:	12/8/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3057.7
Driller's depth:bottom [feet]:	3067.1
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric basalt

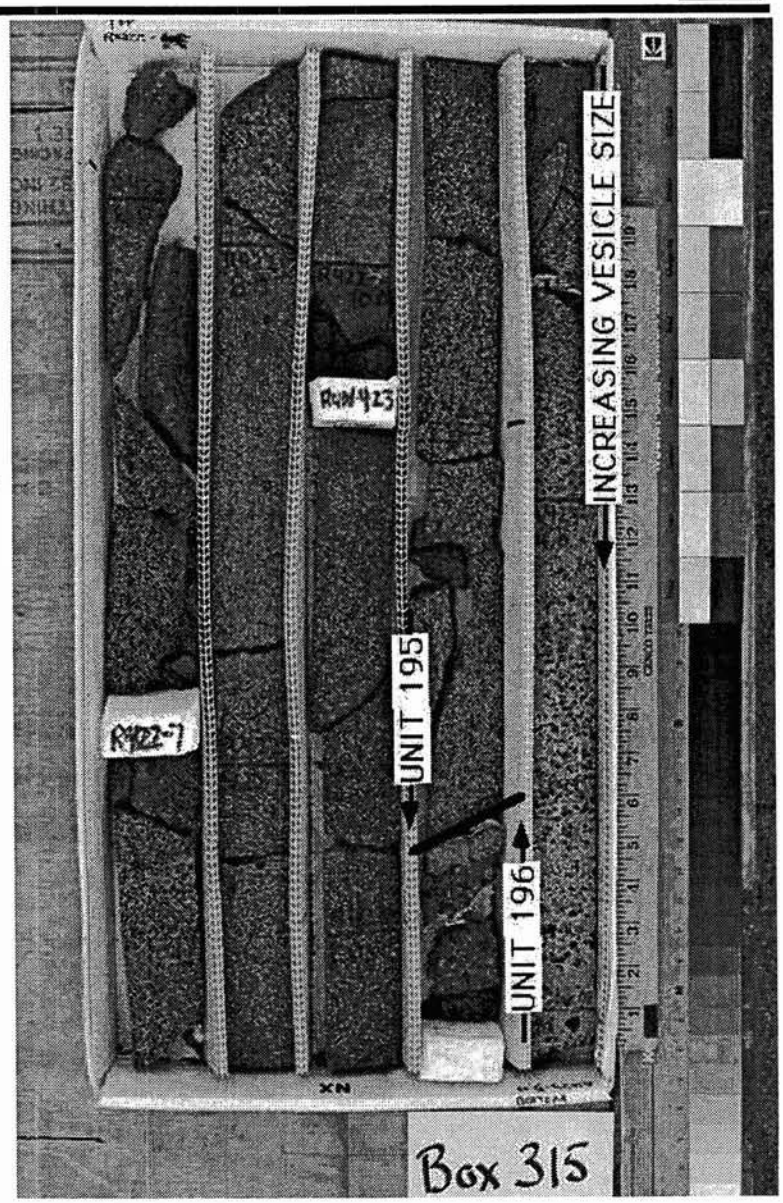
UNIT #: 195

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R423-2.9-3064.9')(flow contact)
weathered fine-grained sandy soil ~3 cm thick
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <<1% – 1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – spherical – equant –
Vesicle size increases steadily moving down from R423-0.0 to the end of the box.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt

UNIT #: 196

Contacts: Top (ft): (R 423-2.9-3064.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
soil/cinder at top
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 2-4 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) –
oxidation
Veins: none
Fractures: weakly: 2/2 ft
Additional comments:



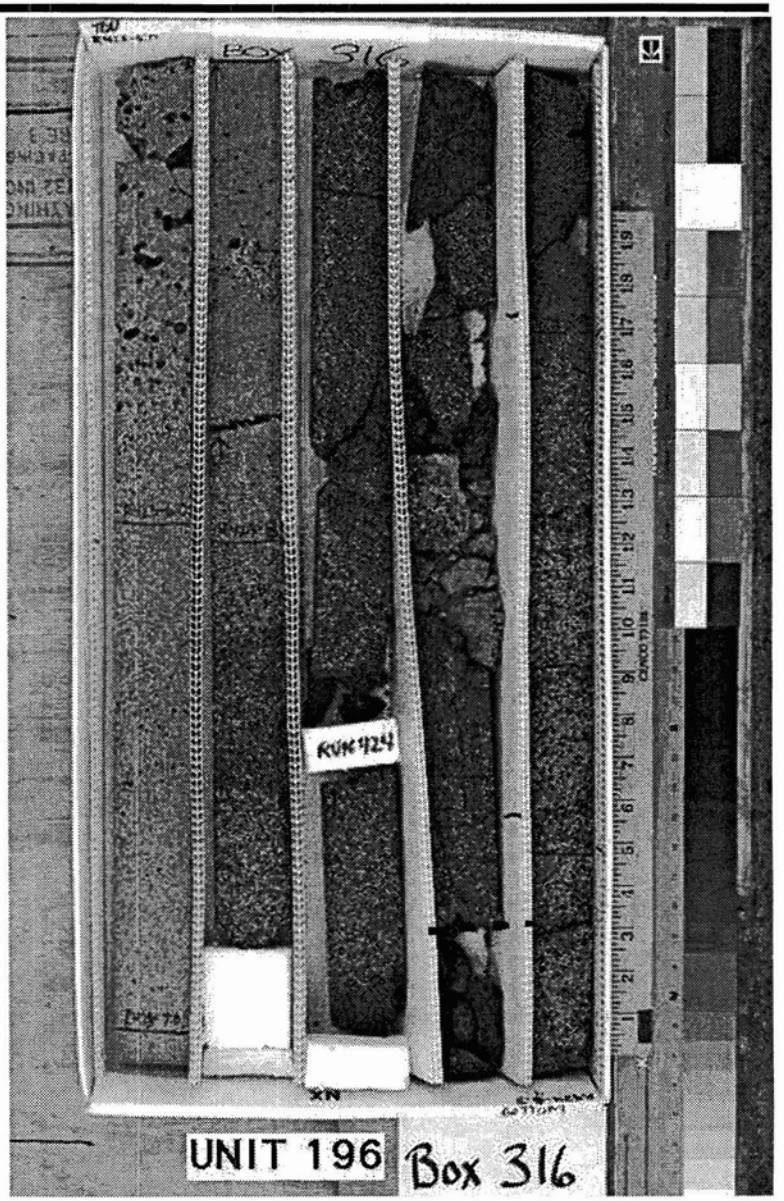
Box #:	Cores in box
316	423 424

Loggers:	GFE, MG
Date logged:	12/8/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3067.1
Driller's depth:bottom [feet]:	3076.3
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:196**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Internal contact at R424-2.5 defined by decreasing vesicle size and some slight alteration, but no lithology change
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <<1% – 1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – spherical – equant–
<5% vesicles between R423-6.0 and R423-7.7.
Alteration: fresh (<2% altered) –
There is a zone of slight alteration from 423-2.5 to R423-3.0 that is reddish-brown in color.
Veins: none
Fractures: weakly fractured: 16/10 ft (greater near base)
Additional comments:
NaCl ppt. Rubble zone from R424-1.0 to R424-1.7 that shows some sandy weathering on individual pieces.



Box #: 317

Cores in box
424
425

Loggers: GFE
Date logged: 12/8/93
Checked by: MG
Check date: 12/14/93

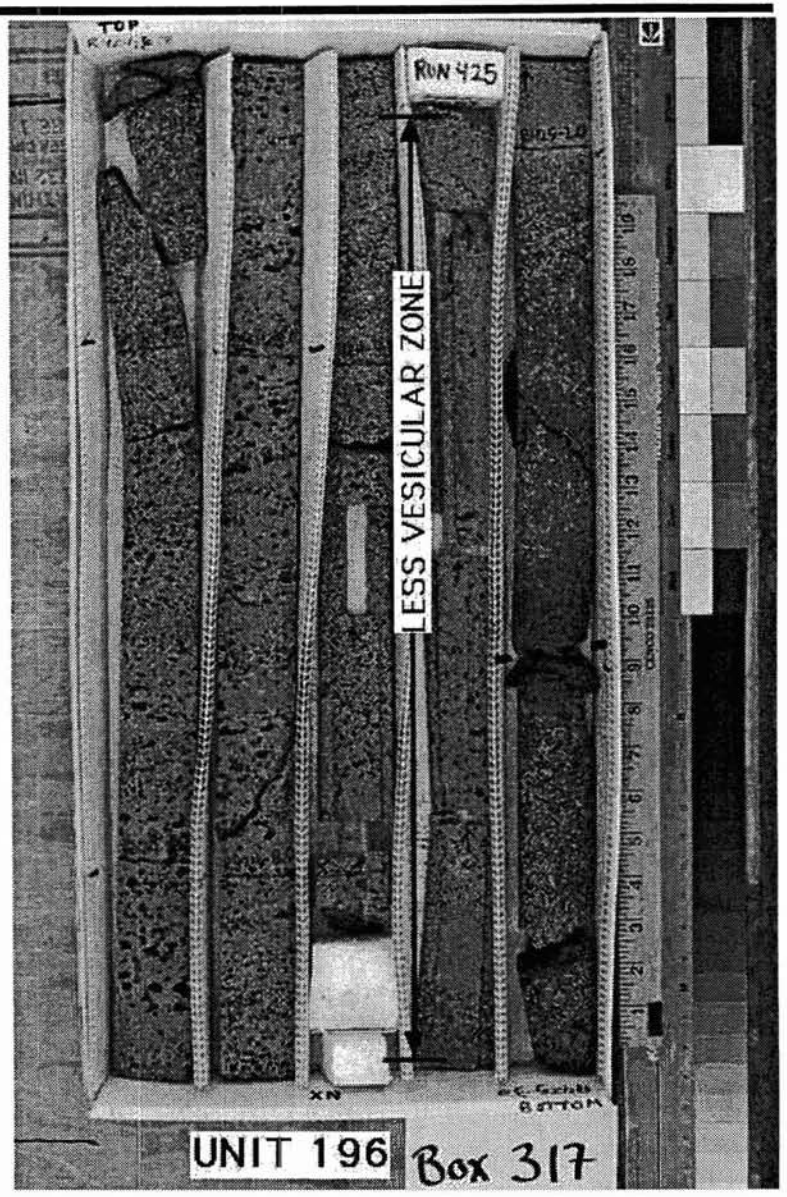
Driller's depth:top [feet]: 3076.3
Driller's depth:bottom [feet]: 3085.2
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:196

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <<1% – 1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant–
large vesicles lined with crystals (quench plagioclase?)
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt



Box #: 318

Cores in box
425 428
426
427

Loggers: LLW
Date logged: 12/8/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3085.2
Driller's depth:bottom [feet]: 3104.7
Core type: NQ

Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 196

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R426-2.2-3091.6')(flow contact)
R426 is missing a lot of core so actual contact not observed but contact defined by lithologic change; 60° internal glassy contact at R425-4.2 (A on photo)

Unit type:
abundant rounded to sub-rounded vesicles

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <<1% – 1 mm – equant –
– – – –
– – – –

Groundmass/Matrix: microcrystalline/fine-grained (<1 mm) –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

Vesicles: 10-20% – 1-5 mm – spherical to sub-rounded – equant –
Vesicle size and abundance increases down section.

Alteration: fresh (<2% altered) –

Veins: none

Fractures: weakly fractured: 20/5.9 ft; fracture surfaces fresh

Additional comments:

BOX UNIT 2: sparsely plagioclase-olivine phyric basalt — UNIT #: 197

Contacts: Top (ft): (R 426-2.2-3091.6')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for top contact description.

Unit type: massive

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1% – 1-2 mm – equant –
olivines fresh
plagioclase – <<1% – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N3 dark gray – **Structures:** – **Sorting:** –

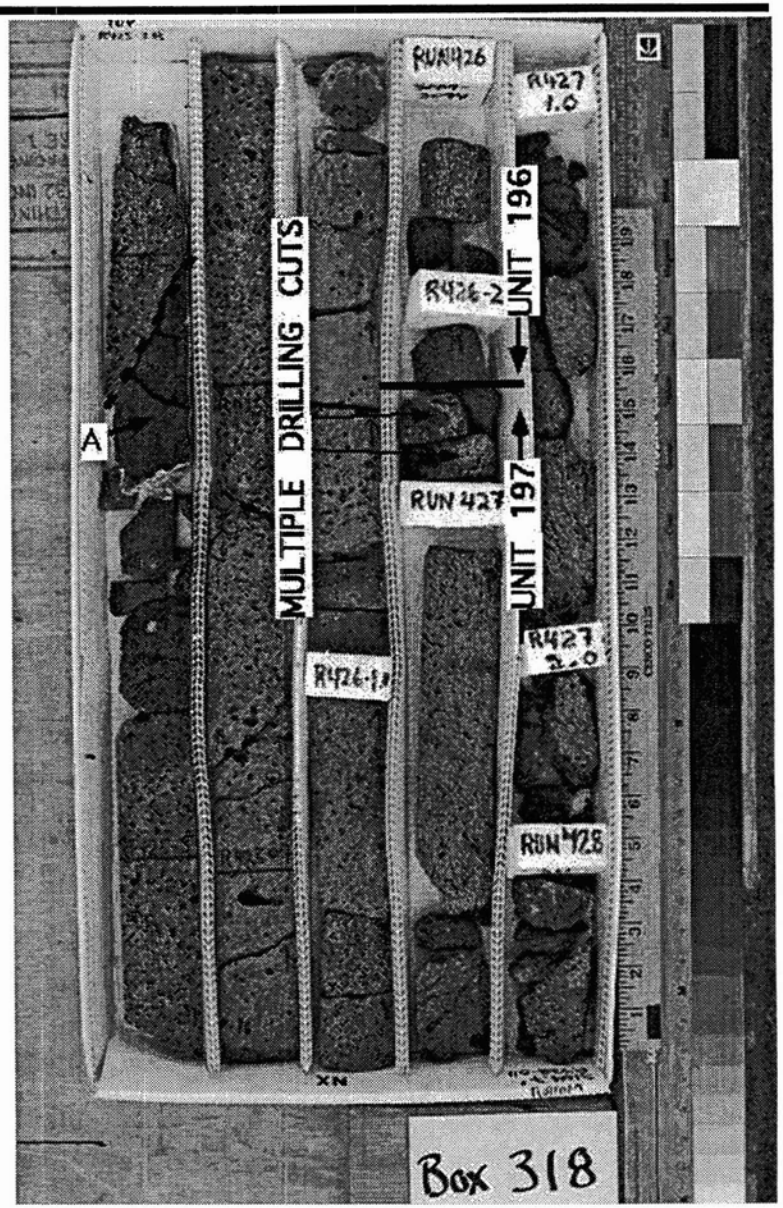
Vesicles: 5-10% – 1-2 mm – sub-angular – vertically elongated –

Alteration: fresh (<2% altered) –

Veins: none

Fractures: moderately to highly fractured

Additional comments:
2 pieces at top of unit have multiple coring cuts (marked on photo)
small (2-4 mm) microgabbroic inclusions



Box #: 319

Cores in box
428
429

Loggers: GFE, MG
Date logged: 12/8/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3104.7
Driller's depth:bottom [feet]: 3118.5
Core type: NQ

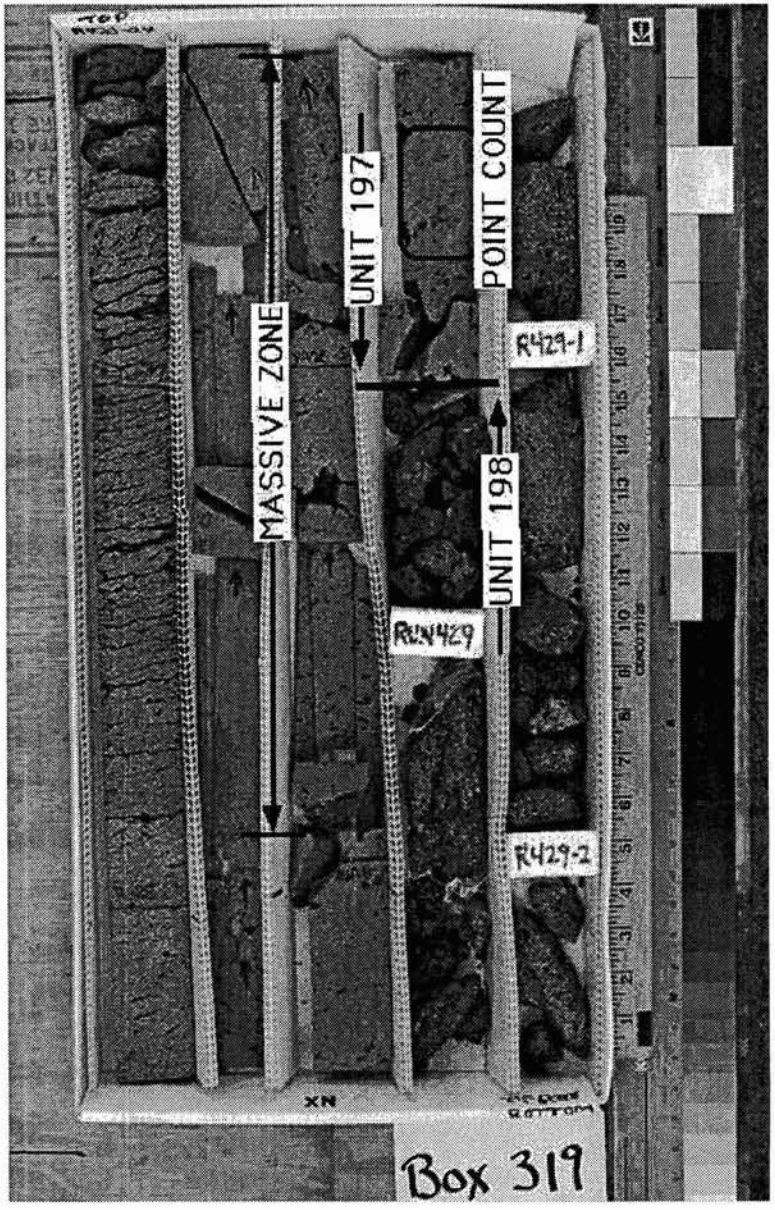
Units in box: 2

BOX UNIT 1: sparsely plagioclase-olivine phyric basalt — UNIT #: 197

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R428-7.0-3109.0')(flow contact)
Contact defined by altered, clinkery zone and a distinct lithology change.
Unit type: aa
Between R428-2.5 and R428-4.0, unit is massive.
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-5 mm – blocky (<3:1:1) –
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: strongly fractured in upper part along vesicles, weakly below R428-1.8 to contact
Additional comments:
NaCl ppt; small (2-4 mm) microgabbro inclusions

BOX UNIT 2: highly phyric olivine basalt — UNIT #: 198

Contacts: Top (ft): (R 428-7.0-3109.0')(flow contact)
Bottom (ft): (R--')(continuous with next box.)
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 5 mm – blocky (<3:1:1) – oxidized
Olivines in rubbly, altered areas are almost all black in color; visual estimate.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – spherical – equant –
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: rubbly
Additional comments:
NaCl ppt



Box #:	Cores in box
320	429 430 431

Loggers:	GFE, MG
Date logged:	12/8/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3118.5
Driller's depth:bottom [feet]:	3131.0
Core type:	NQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt

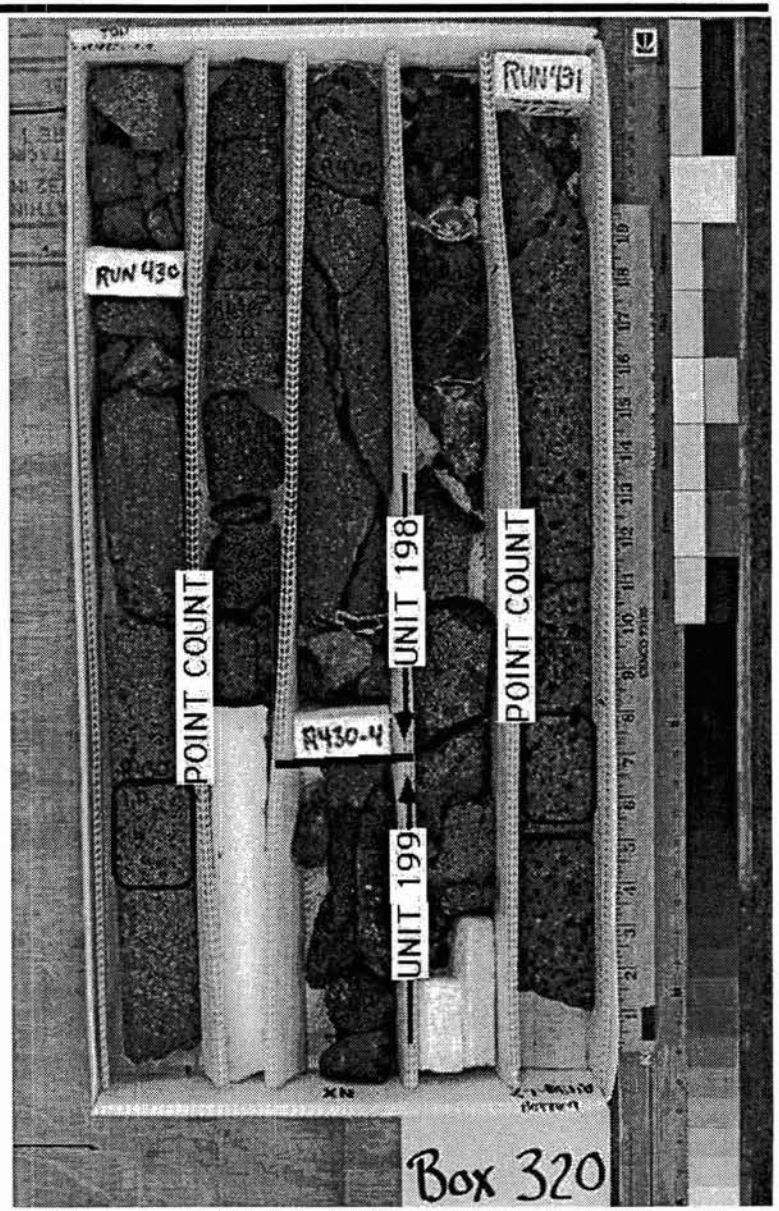
UNIT #: 198

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R430-4.0-3123.0')(flow contact)
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 25% – 1-3 mm – equant –
100 pts counted at R430-1.0
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – equant–
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly to moderately
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt

UNIT #: 199

Contacts: Top (ft): (R 430-4.0-3123.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
no lithology change; rubbly red base
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – tabular (>3:1:1) –
blackened olivines
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 gray– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant–
Alteration: moderately (10-40% altered) –
Groundmass is highly oxidized, but most of the olivine phenocrysts are relatively unaltered. Only a slight amount of alteration for the most part.
Veins: none
Fractures: weakly fractured: 3/2 ft
Additional comments:
NaCl ppt



Box #: 321

Cores in box
431
432

Loggers: LLW
Date logged: 12-9-93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3131.0
Driller's depth:bottom [feet]: 3143.0
Core type: NQ

Units in box: 3

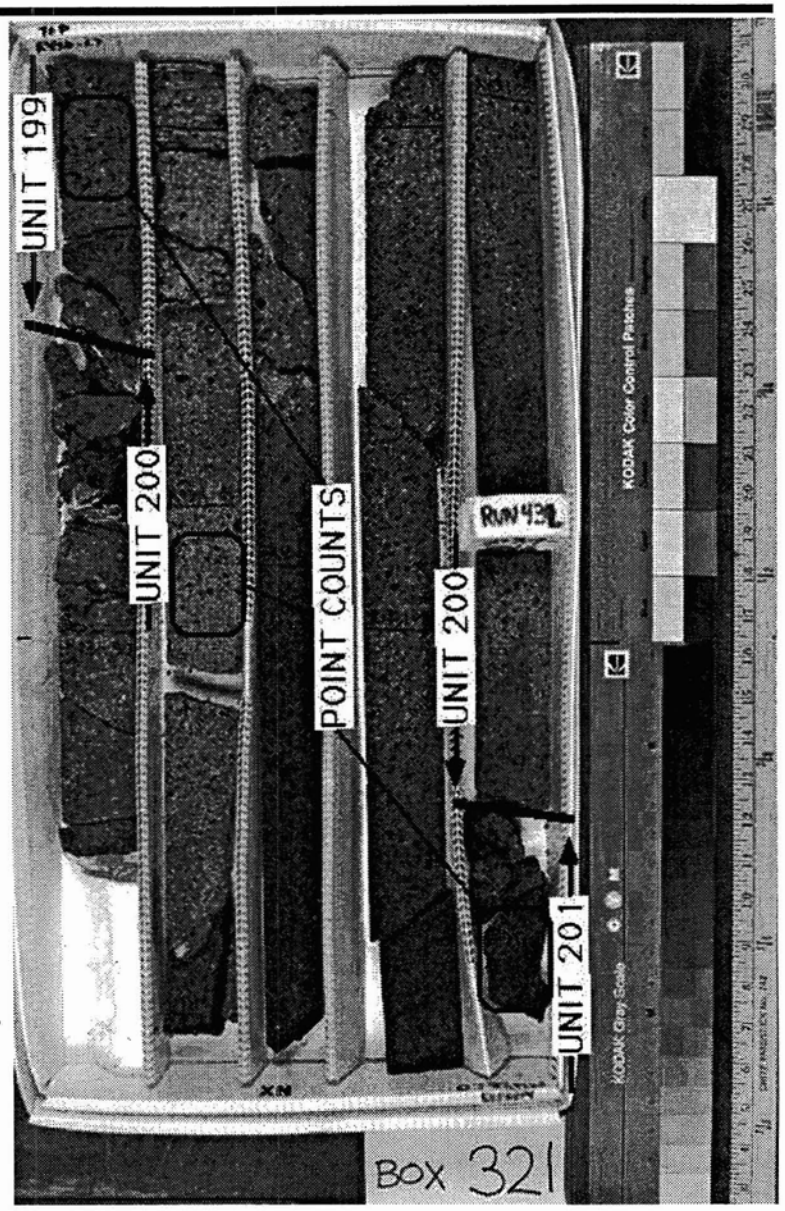
BOX UNIT 1: highly olivine phyric basalt — UNIT #: 199

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R431-2.2-**3131.2**')(flow contact)
contact defined by rubbly zone and vesicle size gradation; no lithology change
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~15% – 1-5 mm – equant – oxidation
14% @ R431-1.9
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR4/1 brownish gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1-5 mm – sub-rounded – equant–
oxidized
Alteration: slightly (2-10% altered) –
groundmass oxidation
Veins: none
Fractures: moderate: 4/0.5 ft
Additional comments:
contact may be internal

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 200

Contacts: Top (ft): (R 431-2.2-**3131.2**')(flow contact)
Bottom (ft): (R432-0.6-**3139.3**')(flow contact)
see unit 1 for top contact description; bottom contact defined by weathered rubbly zone; no lithology change
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-5 mm – equant to tabular – iddingsite
17% @ R431-4.2; some olivine very fresh, others highly altered
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded to sub-angular – equant–
some oxidation
occasional inclined vesicles
Alteration: fresh to moderately (<2-40% altered) –
fresh at top to ~R431-5.6 then moderate groundmass oxidation
Veins: none
Fractures: rubbly at top (R431-2.2 to R431-2.6) otherwise weakly fractured (19/7.5 ft; some "disking"); oxidation along fractures
Additional comments:

BOX 321 CONTINUED ON NEXT PAGE



Box #:	Cores in box
321	431 432

Loggers:	LLW
Date logged:	12-9-93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3131.0
Driller's depth:bottom [feet]:	3143.0
Core type:	NQ
Units in box:	3

BOX UNIT 3: highly olivine phyric basalt

UNIT #: 201

Contacts: Top (ft): (R 432-0.6-3139.3')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 2 for top contact description; no lithology change

Unit type: massive

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – ~15% – 1-5 mm – equant – completely oxidized
15% @ R432-0.8
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: 5YR3/2 grayish brown– **Structures:** – **Sorting:** –

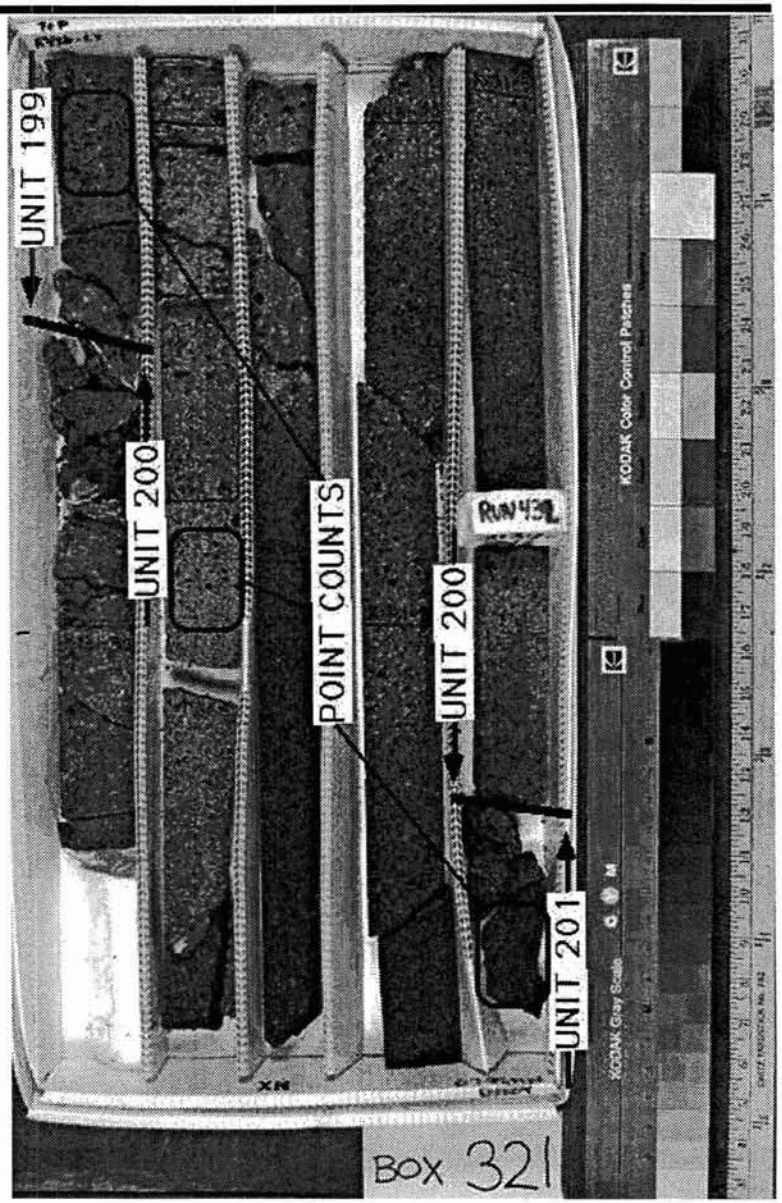
Vesicles: 5-10% – 1-3 mm – sub-rounded – equant–
highly oxidized

Alteration: moderately (10-40% altered) –
groundmass oxidation

Veins: none

Fractures: rubbly top of flow; surfaces oxidized

Additional comments:



Box #: 322

Cores in box: 432, 433

Loggers: LLW
Date logged: 12/9/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3143.0
Driller's depth:bottom [feet]: 3152.3
Core type: NQ

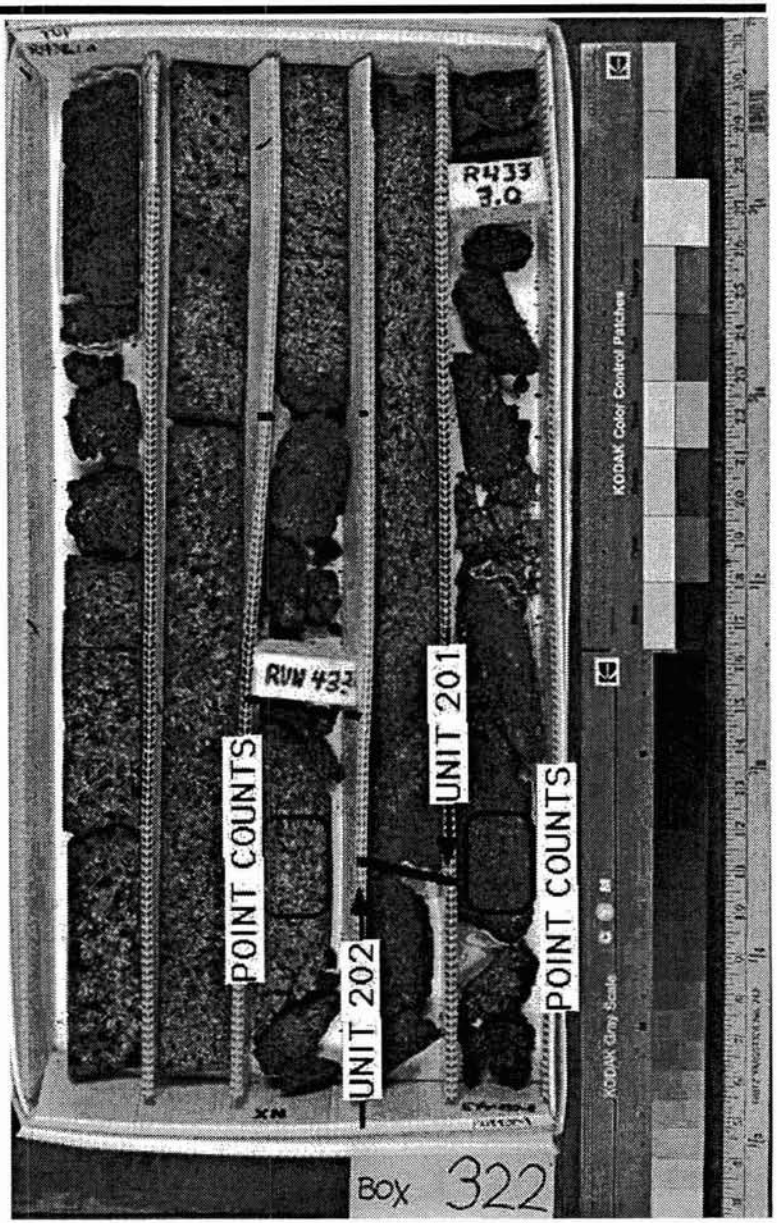
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 201

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R433-2.4-3151.2')(flow contact)
contact defined by rubbly oxidized zone at top of unit 2; no lithology change
Unit type: pahoehoe
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-5 mm – equant – oxidation
18% @ R433-0.4; most olivines completely oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-7 mm – sub-rounded to sub-angular – equant to inclined–
heavily oxidized
vesicle size varies throughout unit; around R432-5.2 vesicles horizontally elongate
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly fractured: 16/7 ft; fracture surfaces oxidized
Additional comments:
NaCl ppt; internal contacts at R432-5.4 and R433-0.0

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 202

Contacts: Top (ft): (R 433-2.4-3151.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-3 mm – equant – oxidation
12% @ R433-3.8; most olivines are completely oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-rounded – equant–
oxidation
Alteration: highly (40-80% altered) –
highly altered at contact
Veins: none
Fractures: highly (see photo)
Additional comments:



Box #:	Cores in box
323	433 434

Loggers:	MBB
Date logged:	12/9/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3152.3
Driller's depth:bottom [feet]:	3163.0
Core type:	NQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt

UNIT #: 202

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R434-2.1-3161.0')(flow contact)
flow contact defined by an oxidized, vesicular zone at the top of the lower flow and a lithologic change; actual contact not cored

Unit type: transitional
classification based on the presence of both sheared and equant vesicles

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 22-28% – 2-5 mm – equant –
22% at R433-5.3; 28% at R434-1.5; spinel inclusions in the olivine phenocrysts; olivine crystal clots; olivines are slightly to highly oxidized (includes MnO coatings), with minor iddingsite.
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 + 5R 3/4 – **Structures:** – **Sorting:** –

Vesicles: 5-20% – <1-5 mm – subrounded to subequant – equant to elongate –
see photo for variation in vesicularity with depth; two populations of vesicles, one ≥1 mm and the other <<1 mm; region between R433-7.0 to R433-9.4 contains highly-sheared vertical vesicle trains

Alteration: moderately to highly (40-80% altered) –
Extent of groundmass oxidation is slightly higher within 1 ft of the top contact; relatively uniform throughout the remainder of the core.

Veins: none

Fractures: weakly fractured: 14/7.7 ft; groundmass exposed at the fractures is more oxidized than in the split face of the core

Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt

UNIT #: 203

Contacts: Top (ft): (R 434-2.1-3161.0')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for a description of the contact.

Unit type: pahoehoe
classification based on the high abundance and the morphology of the vesicles

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – ≤1 mm – equant –
visually estimated mode; no obvious spinel inclusions; olivines are very highly oxidized (includes MnO coatings)
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: 10R 4/2 + 5R 3/4 – **Structures:** – **Sorting:** –

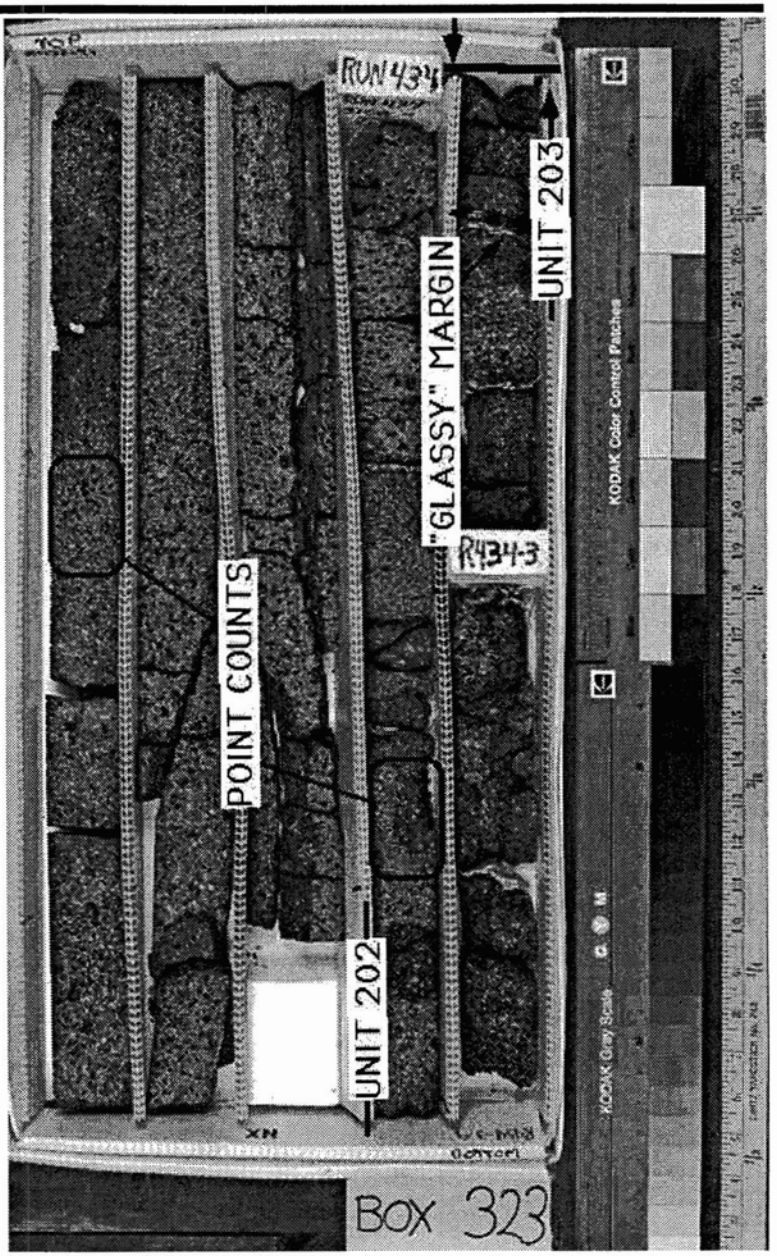
Vesicles: >30% – <1-4 mm – rounded to subrounded – equant –

Alteration: highly to very highly (40-95% altered) –
groundmass oxidation

Veins: none

Fractures: moderately fractured: >16/2 ft; core is close to being highly fractured at the top of the flow

Additional comments:
NaCl ppt; glassy flow surface at R434-2.6



Box #:	Cores in box
324	434 435

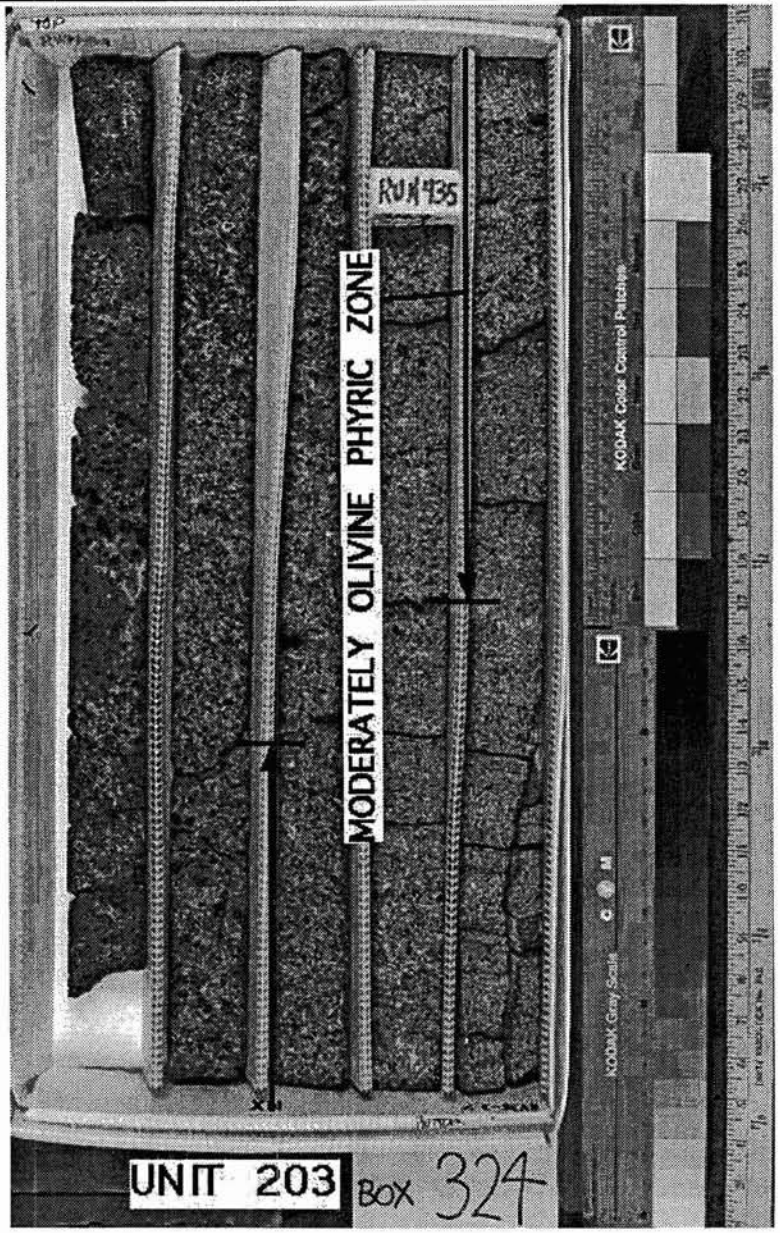
Loggers:	LLW
Date logged:	12/9/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3163.0
Driller's depth:bottom [feet]:	3172.6
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:203

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
abundant rounded to sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) – aphyric except for ~5% olivine zone at R434-9.0 to R435-1.0
olivine – <1% – 1-2 mm – equant –
olivine more abundant between R434-6.5 to R435-2.5 (MG)
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – spherical to sub-rounded – equant–
vesicle size and abundance variable, both generally decreasing down section
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 20/9.6 ft
Additional comments:
NaCl ppt



Box #: 325

Cores in box
435
436

Loggers: GFE, MG
Date logged: 12/9/93
Checked by: MG
Check date: 12/14/93

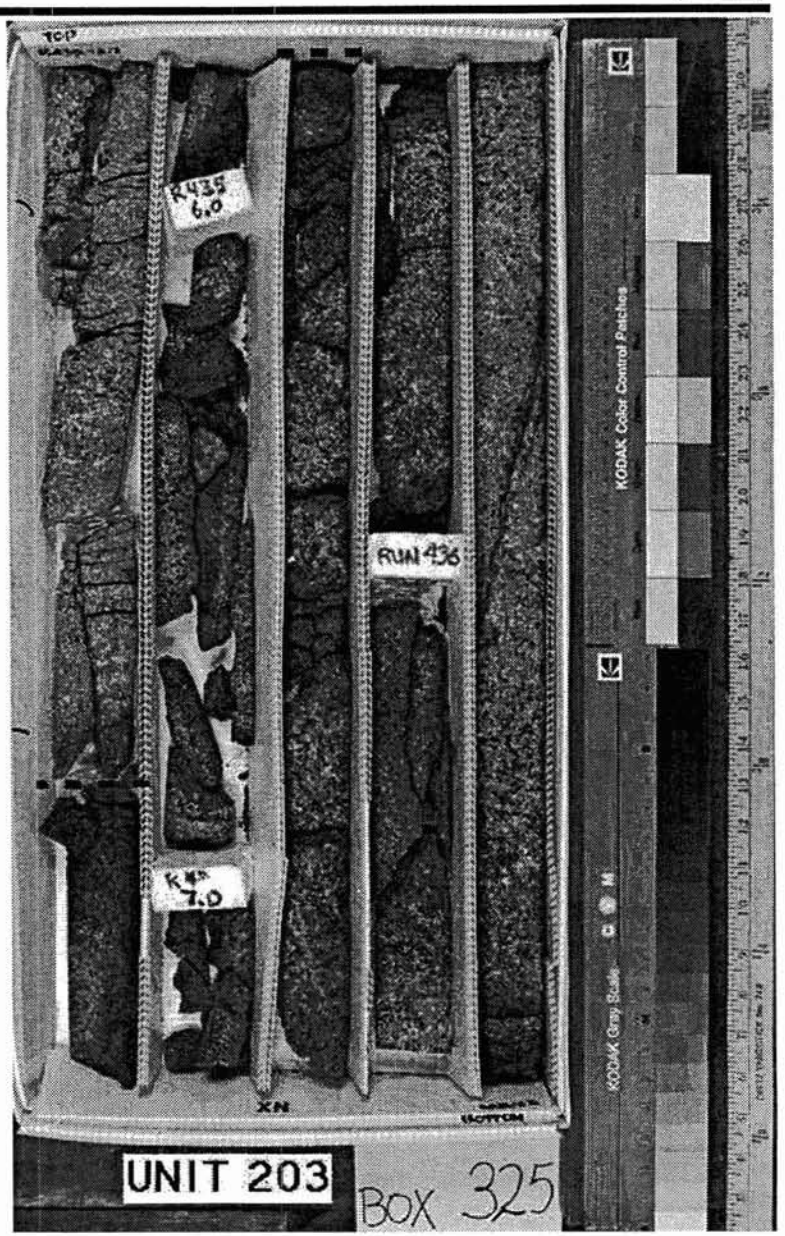
Driller's depth:top [feet]: 3172.6
Driller's depth:bottom [feet]: 3181.8
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric to moderately olivine phyric basalt

UNIT #:203

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Flow contains at least 2 internal contacts.
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric to moderately phyric (<1-10%) –
olivine – <1-3% – 1-2 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Core becomes more altered near internal contacts.
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt



Box #:	Cores in box
326	436 437

Loggers:	GFE, MG
Date logged:	12/9/93
Checked by:	MG
Check date:	12/14/93

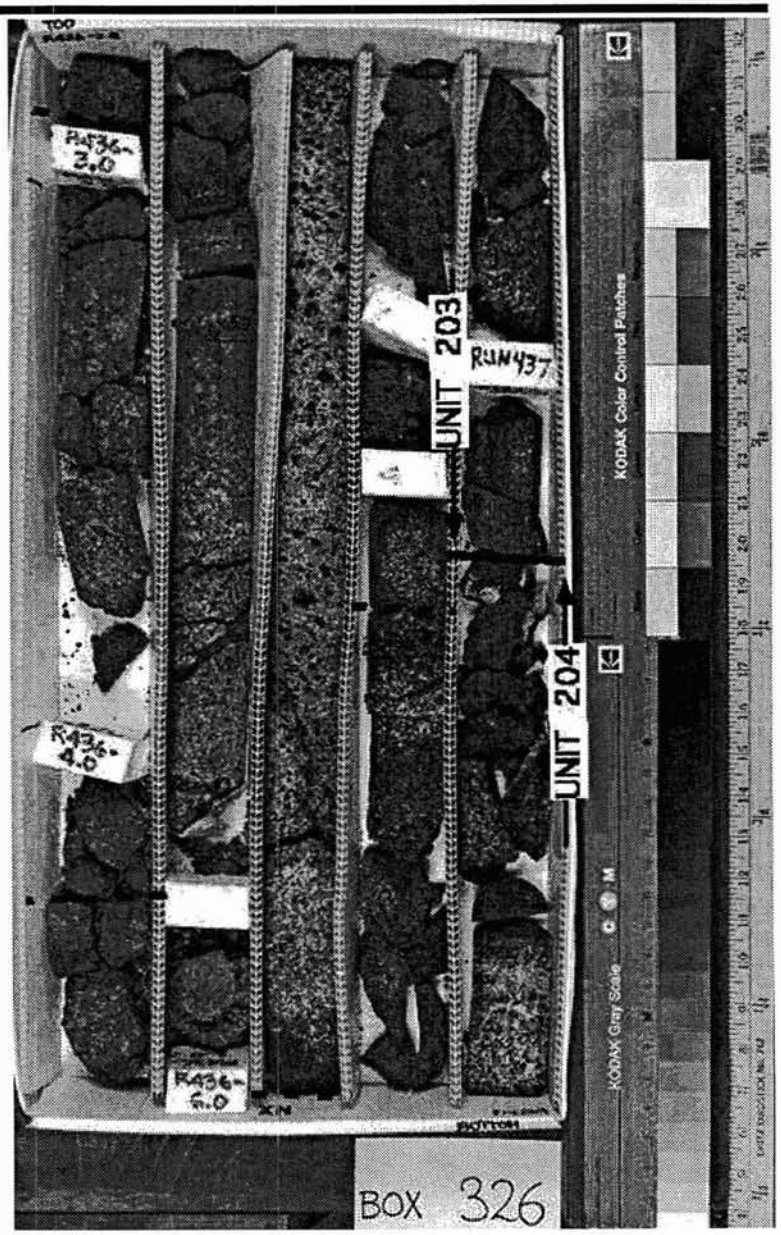
Driller's depth:top [feet]:	3181.8
Driller's depth:bottom [feet]:	3191.9
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 203

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R437-0.4-**3189.8**')(flow contact)
Internal contacts @ R436-3.0, 4.2, 8.1, and 8.9 defined by decreasing vesicle size toward the contact, but no distinct lithologic change.
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1 mm – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – spherical – equant –
Alteration: slightly (2-10% altered) –
Flow becomes more altered near internal and flow contacts.
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt

BOX UNIT 2: sparsely phyric olivine basalt — UNIT #: 204

Contacts: Top (ft): (R 437-0.4-**3189.8**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
contact defined by red, glassy rubble
Unit type: pahoehoe
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 2 mm – blocky (<3:1:1) – iddingsite
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – spherical – equant –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt; open textured microgabbro inclusions



Box #: 327

Cores in box
437
438

Loggers: GFE, MG
Date logged: 12/9/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3191.9
Driller's depth:bottom [feet]: 3199.0
Core type: NQ

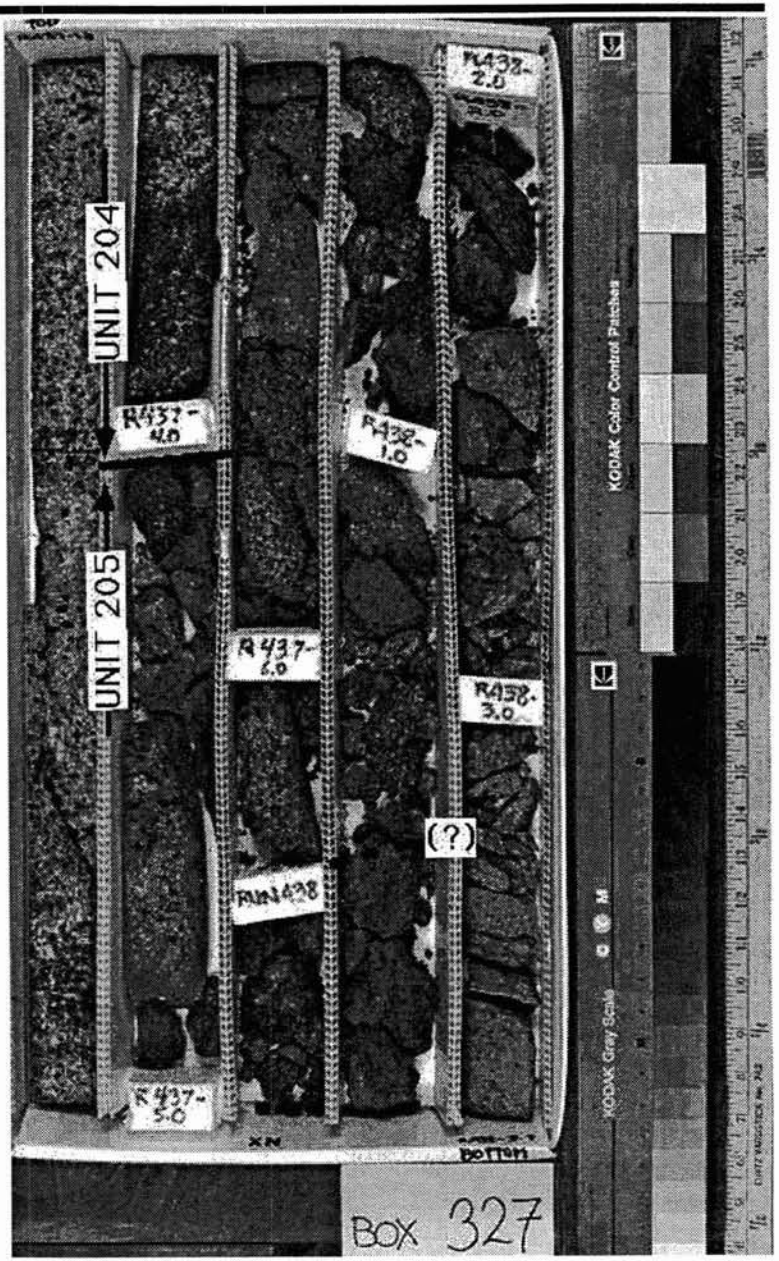
Units in box: 2

BOX UNIT 1: sparsely olivine phyric basalt — UNIT #: 204

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R437-4.0-3193.4')(flow contact)
Flow contact defined by decrease in vesicle size toward the contact and a distinct lithology change.
Unit type: pahoehoe
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1% – 2 mm – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant–
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 205

Contacts: Top (ft): (R 437-4.0-3193.4')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Core is mostly rubbly except for "disking" of massive unit past R438-3.0.
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-12% – 1-5 mm – tabular (>3:1:1) –
100 pts counted at R437-6.2; olivines near contacts are very altered and almost all black in color. Also, spinel inclusions appear inside of some of the olivine phenocrysts.
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 gray– **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded – equant–
variable, some zones >30%
Alteration: slightly (2-10% altered) –
Core becomes more altered near contact.
Veins: none
Fractures: rubbly
Additional comments:
NaCl ppt



Box #: 328

Cores in box
438
439
440

Loggers:	GFE
Date logged:	12/9/93
Checked by:	MG
Check date:	12/14/93

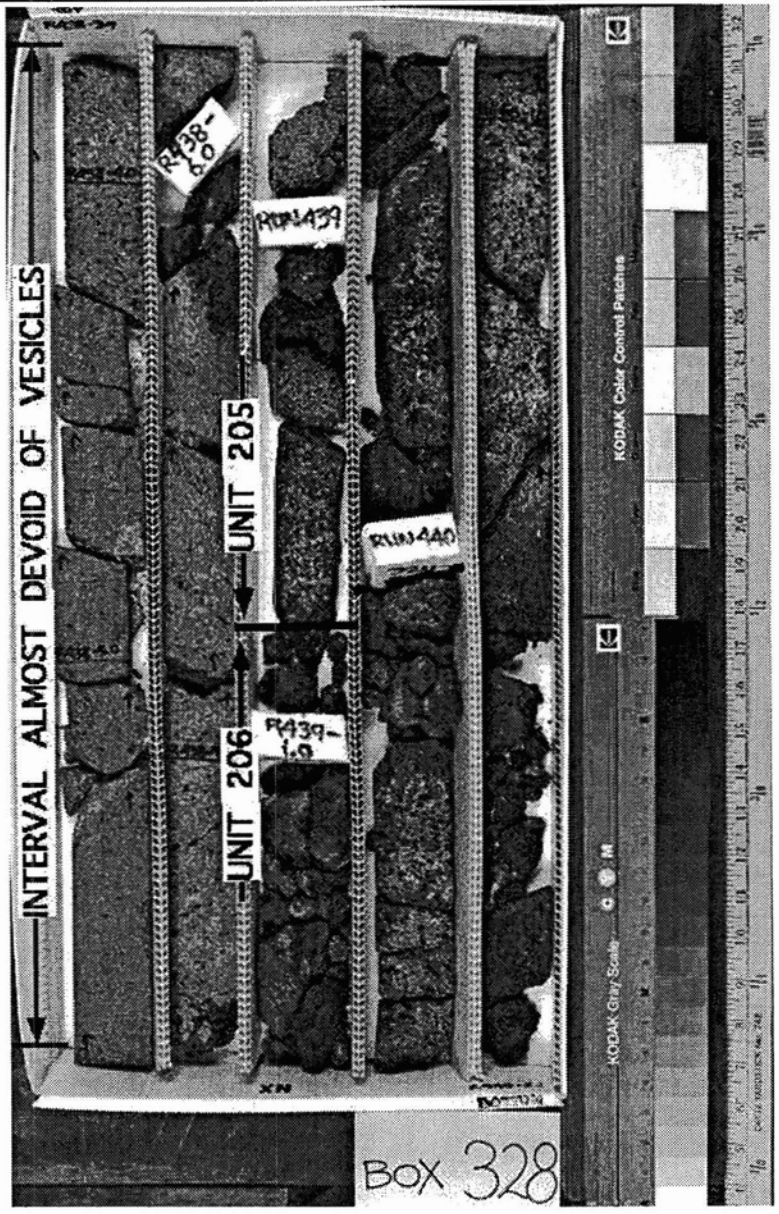
Driller's depth:top [feet]:	3199.0
Driller's depth:bottom [feet]:	3213.7
Core type:	NQ
Units in box:	2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 205

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R439-0.9-**3207.9**')(flow contact)
Unit type: massive
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 10-15% – 3mm – blocky (<3:1:1) –
Spinel inclusions appear within the olivine phenocrysts. 100 pts counted at R438-4.0.
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline –
Color: N5 gray – **Structures:** – **Sorting:** –
Vesicles: <5% – 1-5 mm – sub-rounded – horizontally elongated –
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 206

Contacts: Top (ft): (R 439-0.9-**3207.9**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
internal flow contact at R440-0.0
Unit type: pahoehoe
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6% – – blocky (<3:1:1) –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) to microcrystalline –
Color: 5YR 3/4 reddish-brown – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded – equant –
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: weakly fractured
Additional comments:
NaCl ppt



Box #:	Cores in box
329	440 441 442

Loggers:	MBB, LLW
Date logged:	12-10-93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3213.7
Driller's depth:bottom [feet]:	3230.0
Core type:	NQ
Units in box:	3

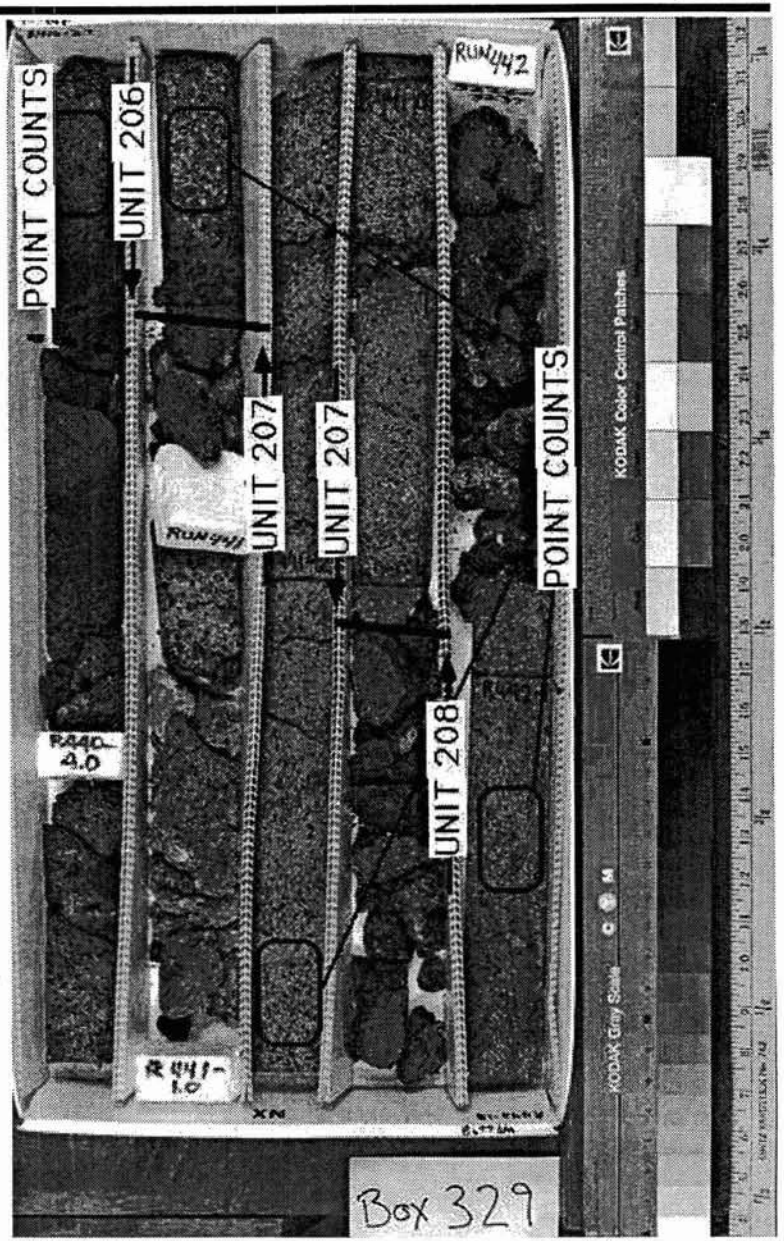
BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 206

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R440-5.1-**3216.1**')(flow contact)
contact defined by vesicle size gradation and lithology change
Unit type: pahoehoe
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-10% – 1-5 mm – equant – oxidation
5% @ R440-2.9; 9% @ R440-4.7
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded to sub-angular – equant – oxidation
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: weakly to moderately fractured: 8/2.4 ft; fracture surfaces oxidized
Additional comments:
NaCl ppt; internal flow contact at R440-3.2

BOX UNIT 2: highly olivine phyric basalt — UNIT #: 207

Contacts: Top (ft): (R 440-5.1-**3216.1**')(flow contact)
Bottom (ft): (R441-4.1-**3223.1**')(flow contact)
See unit 1 for top contact description; bottom contact defined by weathered rubbly zone; no distinct lithology change.
Unit type: aa
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 15-20% – 1-5 mm – equant to tabular – iddingsite
16% @ R441-2.8
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 1-5 mm – sub-rounded to angular – equant to vertically elongated – oxidation
larger, more abundant, sub-rounded vesicles from top of unit to R441-1.6 grading into vertically elongate less abundant vesicles
Alteration: moderately (10-40% altered) –
moderate groundmass oxidation
Veins: none
Fractures: highly fractured - R440-5.1 to R441-1.0; weakly fractured otherwise (6/3.1 ft; see photo)
Additional comments:

BOX 329 CONTINUED ON NEXT PAGE



Box #:	Cores in box
329	440 441 442

Loggers:	MBB, LLW
Date logged:	12-10-93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3213.7
Driller's depth:bottom [feet]:	3230.0
Core type:	NQ
Units in box:	3

BOX UNIT 3: highly olivine phyric basalt **UNIT #:208**

Contacts: Top (ft): (R 441-4.1-3223.1')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 2 for top contact description; no lithology change

Unit type: aa

Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – >10% – 1-5 mm – equant – iddingsite, oxidation
16% @ R442-1.5; some olivines are fresh
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N3 dark gray– **Structures:** – **Sorting:** –

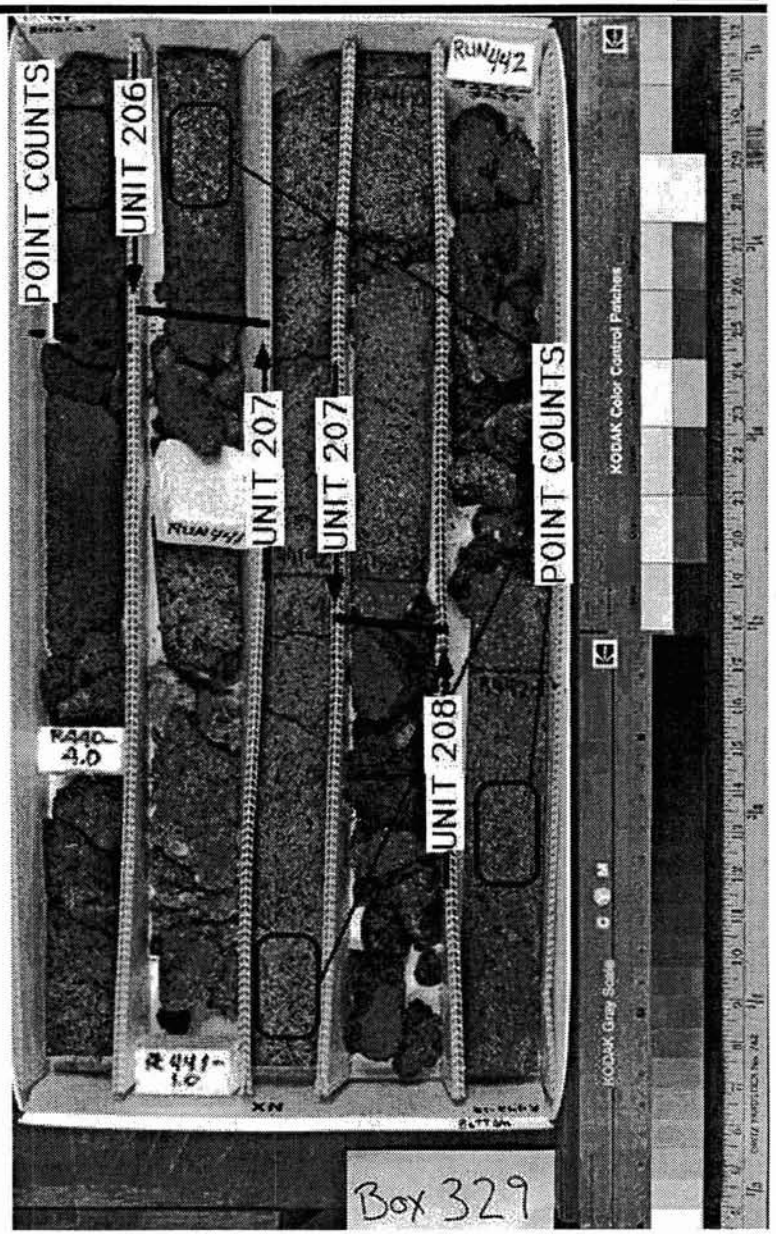
Vesicles: 10-20% – 1-3 mm – sub-angular to angular – equant to vertically elongated– oxidation

Alteration: slightly (2-10% altered) –

Veins: none

Fractures: Rubbly from R441-4.1 to R442-0.8, then unfractured to end of box; rubble is oxidized on surfaces.

Additional comments:



Box #: 330

Cores in box
442
443

Loggers: LLW
Date logged: 12/9/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3230.0
Driller's depth:bottom [feet]: 3241.5
Core type: NQ

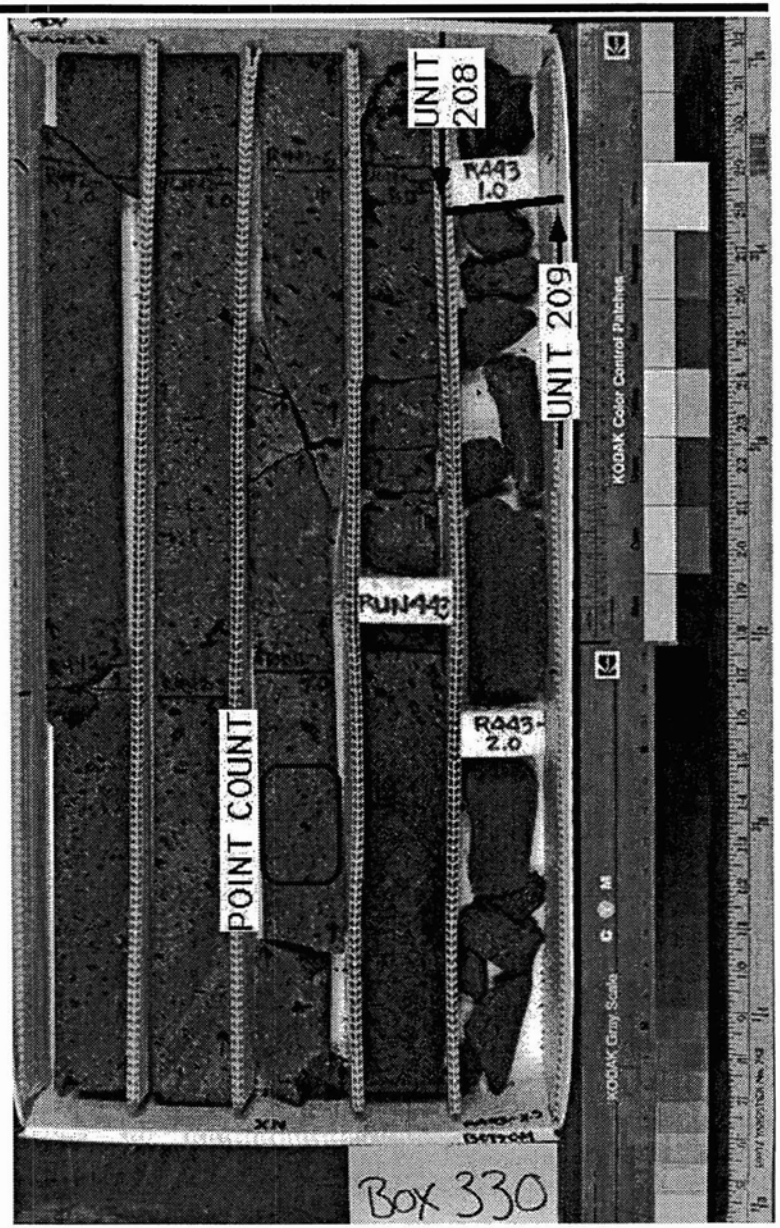
Units in box: 2

BOX UNIT 1: highly olivine phyric basalt — UNIT #: 208

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R443-1.0-3235.8')(flow contact)
contact determined by rubbly weathered zone at top of unit 2 and lithology change
Unit type: massive
Phenocrysts/Clasts:
highly phyric (>10%) –
olivine – 10-15% – 1-5 mm – equant to rounded – iddingsite
12% @ R442-7.5; spinel inclusions observed
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1-7 mm – sub-rounded – equant – oxidation
larger vesicles slightly horizontally elongate; size grades from smallest at top of box to largest from R442-1.8 to R443-0.2 back to smallest towards contact
Alteration: moderately (10-40% altered) –
moderate groundmass oxidation
Veins: none
Fractures: weakly fractured: 11/8.1 ft; oxidation on fracture surfaces
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 209

Contacts: Top (ft): (R 443-1.0-3235.8')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for top contact description.
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 10R3/4 dark reddish brown – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-2 mm – sub-rounded – equant – oxidation
Alteration: highly (40-80% altered) –
groundmass oxidation/palagonitization at top
Veins: none
Fractures: moderately (see photo)
Additional comments:
tiny bit of glass at contact, mostly palagonitized



Box #: 331

Cores in box
443
444

Loggers: TJ
Date logged: 12/10/93
Checked by: MG
Check date: 12/14/93

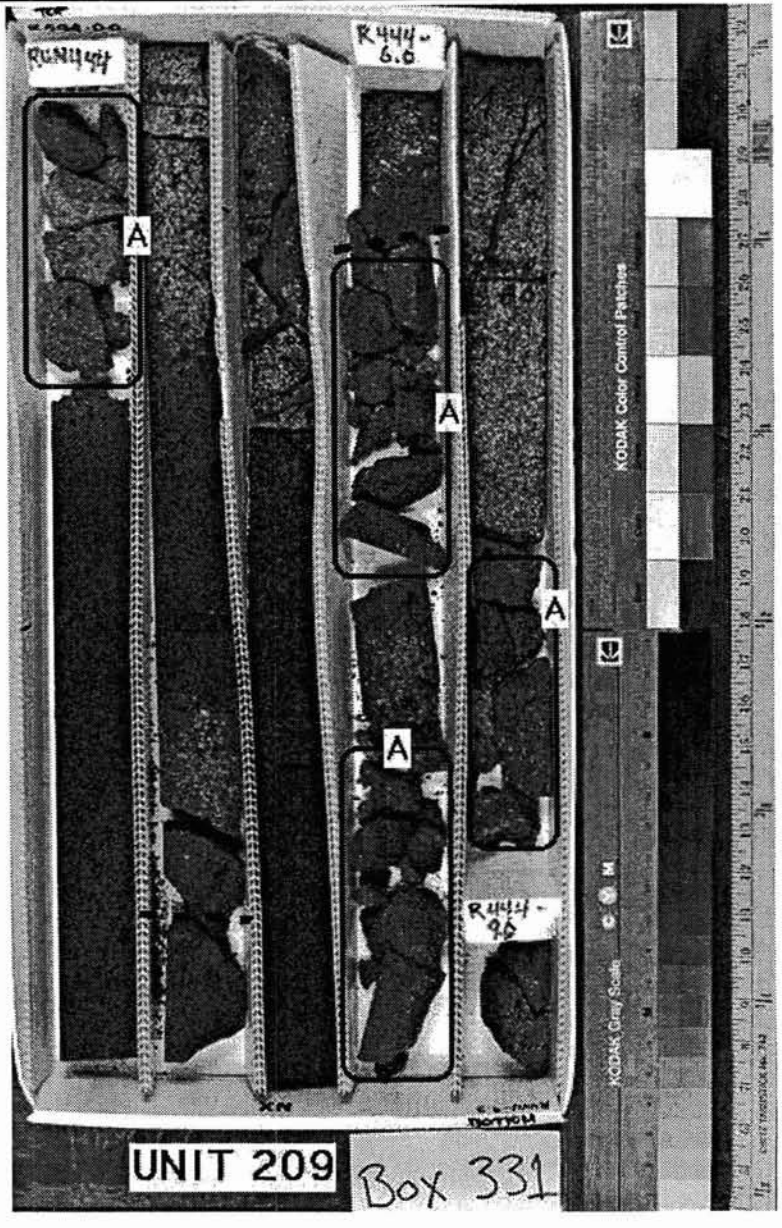
Driller's depth:top [feet]: 3241.5
Driller's depth:bottom [feet]: 3250.9
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:209

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
internal flow contacts at R444-3.6, 6.2
Unit type: pahoehoe
equant, abundant vesicles
Phenocrysts/Clasts:
aphyric (<1%) – rare olivine microphenocrysts (<1%)
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: grayish black – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – subrounded to angular – equant –
oxide coatings in rubble zones; other yellow coatings at R444-8.8
Alteration: fresh to moderately (<2-40% altered) – groundmass oxidation
fresh except: R444-0.0 to -0.5, moderately altered; R444-6.1 to -9.2, slightly altered
Veins: none
Fractures: weakly fractured: 9/6.7', excluding 4 rubble zones marked A on photo
Additional comments:
NaCl ppt



Box #: 332

Cores in box
444
445

Loggers: TJ
Date logged: 12/10/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3250.9
Driller's depth:bottom [feet]: 3261.0
Core type: NQ

Units in box: 3

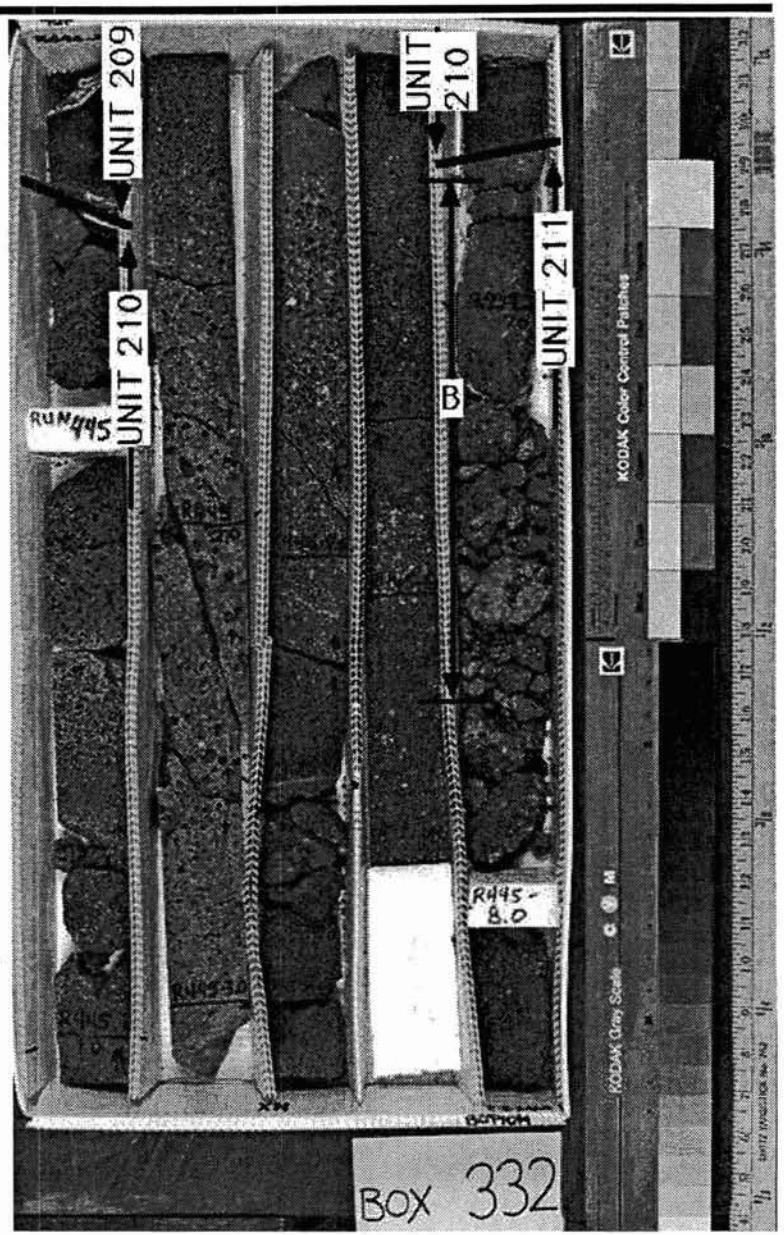
BOX UNIT 1: aphyric basalt — UNIT #: 209

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R444-9.6-3251.1')(flow contact)
1" red weathered zone below bottom contact, glassy base
Unit type: pahoehoe
equant, abundant vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: grayish black – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – spherical – equant–
Alteration: fresh to moderately (<2-40% altered) – groundmass oxidation
altered only in bottom 1"
Veins: none
Fractures:
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 210

Contacts: Top (ft): (R 444-9.6-3251.1')(flow contact)
Bottom (ft): (R445-6.7-3258.2')(flow contact)
See unit 1 for top contact. Bottom contact: Vesicle size decreases, 1' orange soil below
Unit type: pahoehoe
abundant rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) – 10% olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: dark gray– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – rounded to sub-rounded – equant–
Alteration: fresh to slightly (<2-10% altered) – groundmass oxidation
Top 2" and bottom 2" slightly altered, otherwise fresh.
Veins: none
Fractures: weakly fractured: 16/7.0 ft
Additional comments:
NaCl ppt; internal contact at R445-4.3'

BOX 332 CONTINUED ON NEXT PAGE



Box #: 332

Cores in box
444
445

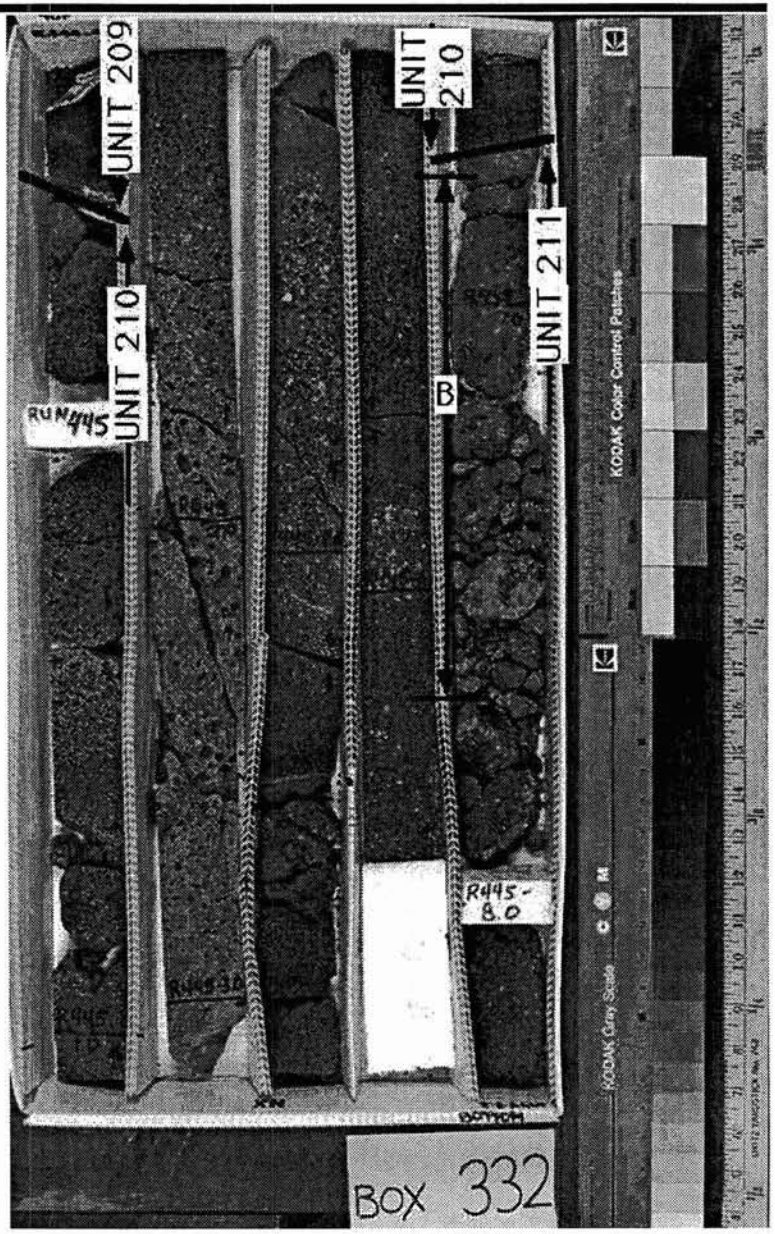
Loggers: TJ
Date logged: 12/10/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3250.9
Driller's depth:bottom [feet]: 3261.0
Core type: NQ

Units in box: 3

BOX UNIT 3: moderately phyric olivine basalt **UNIT #: 211**

Contacts: Top (ft): (R 445-6.7-3258.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Top has 1' weathered zone, marked B on photo, overlain by next flow.
Unit type: transitional/aa
angular vesicles, sparse in center of flow
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 6-10% – 1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-5 mm – sub-rounded to angular – equant to elongate–
Alteration: fresh to highly (<2-80% altered) – clay, oxides
Oxide coatings on vesicle surfaces above R445-8.0. Soil: R445-6.7 to 7.7.
Veins: none
Fractures: entire length is rubble in this box
Additional comments:
NaCl ppt. 1' weathered zone at top (R445-6.7 to 7.7); orange soil with chunks of intact lava.



Box #: 333

Cores in box: 446

Loggers: MBB
Date logged: 12/10/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3261.0
Driller's depth:bottom [feet]: 3270.1
Core type: NQ

Units in box: 2

BOX UNIT 1: moderately to highly olivine phyric basalt — UNIT #: 211

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R446-7.9-3268.9')(flow contact)
flow contact defined by lithologic change (more to less olivine phyric) and the appearance of plagioclase in the lower unit; no other really distinct contact features

Unit type: transitional/aa
Classification based on vesicle morphology; the top of the flow has more equant vesicles than are generally observed at the tops of aa flows.

Phenocrysts/Clasts:
moderately to highly phyric (2->10%) –
olivine – 9-16% – 2-5 mm – equant –
9% at R446-0.7; 16% at R446-2.6; 15% at R446-7.3; no obvious spinel inclusions in the olivines; olivine phenocrysts are fresh to slightly oxidized
– – – –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

Vesicles: 5-20% – <1-5 mm – rounded to subangular – equant to horizontally elongate –
zone of highly sheared vesicle trains in the interval R446-5.0 to R446-6.7

Alteration: fresh to slightly (<2-10% altered) – groundmass oxidation

Veins: none

Fractures: weakly fractured: 15/7.9; some fractures have a dusting of soft yellow/orange material (clay?)

Additional comments:
NaCl ppt

BOX UNIT 2: moderately plagioclase-olivine phyric basalt — UNIT #: 212

Contacts: Top (ft): (R 446-7.9-3268.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for a description of the flow contact.

Unit type: pahoehoe
classification based on vesicle morphology

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 1-2% – 1-2 mm – equant – highly oxidized
2% at R446-8.4
plagioclase – 1% – ~1 mm – laths –
1% at R446-8.4; plagioclase appears highly altered, milky white in color (sericite?)
– – – –

Groundmass/Matrix: microcrystalline –

Color: 10R 4/2 grayish red – **Structures:** – **Sorting:** –

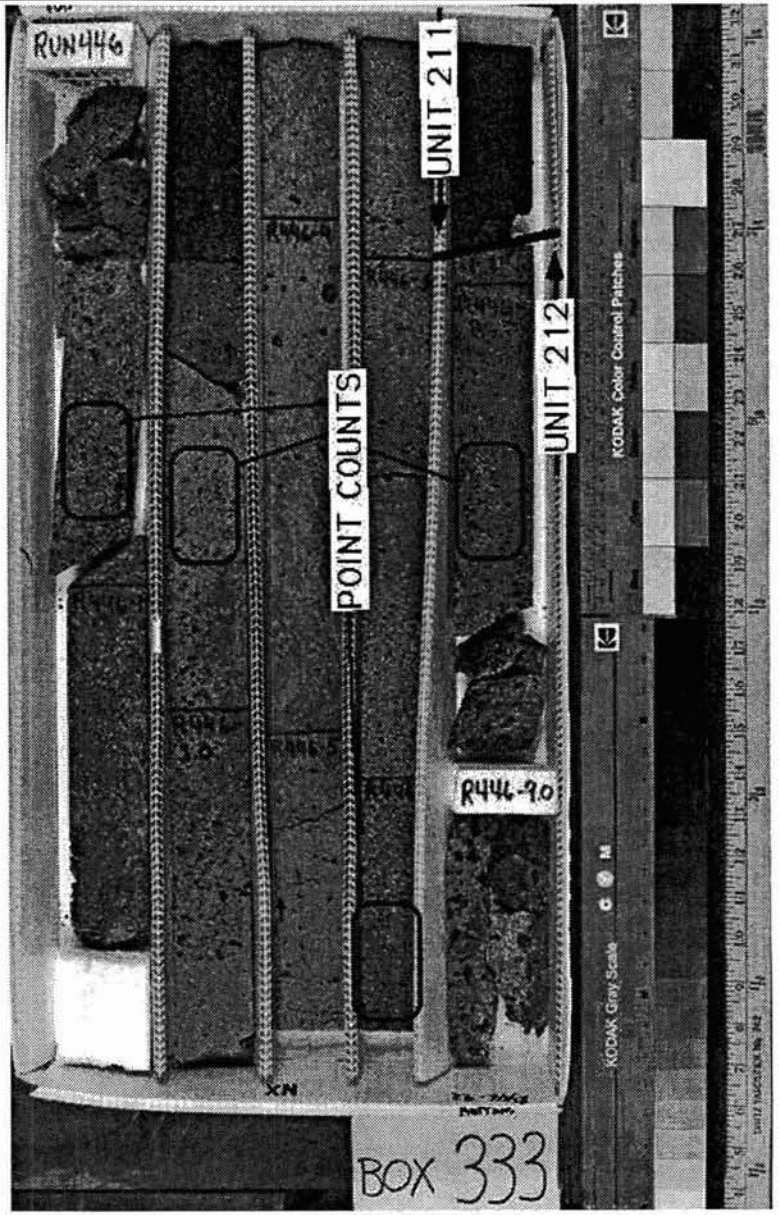
Vesicles: 10-15% – 1-10 mm – rounded to subrounded – equant to sub- horizontally elongate –
Vesicle size increases and volume% decreases away from the contact.

Alteration: slightly to highly (2-80% altered) – groundmass oxidation
Extent of groundmass oxidation decreases away from contact; yellowish clay on fracture.

Veins: none

Fractures: moderately fractured: 5/1.4 ft

Additional comments:
small (2-4 mm) microgabbroic inclusions



Box #:	Cores in box
334	446 447 448

Loggers:	LLW
Date logged:	12/10/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3270.1
Driller's depth:bottom [feet]:	3281.1
Core type:	NQ
Units in box:	2

BOX UNIT 1: moderately plagioclase-olivine phyric basalt — UNIT #: 212

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R447-3.8-3274.9')(flow contact)
contact defined by weathered zone at top of unit 2, vesicle size gradation and lithology change

Unit type: —
Some zones have abundant rounded vesicles and some are more massive-aa like zones.

Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 1-2% – 1-2 mm – equant to tabular –
2% @ R447-0.8
plagioclase – <1% – <1 mm – tabular (>3:1:1) –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

Vesicles: 10-20% – <1-5 mm – sub-rounded to sub-angular – equant –
Abundance and size of vesicles is variable throughout unit.

Alteration: fresh (<2% altered) –

Veins: none

Fractures: weakly fractured: ~12/4.3 ft; fractures at top of box coated with yellow-orange clay (?), visible in photo

Additional comments:
NaCl ppt

BOX UNIT 2: sparsely olivine phyric basalt — UNIT #: 213

Contacts: Top (ft): (R 447-3.8-3274.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for top contact description.

Unit type: pahoehoe
abundant sub-rounded vesicles

Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-3 mm – equant – iddingsite
1% @ R447-6.6
plagioclase – <<1% – 1 mm – tabular (>3:1:1) –
– – – –

Groundmass/Matrix: microcrystalline –

Color: N4 medium gray – **Structures:** – **Sorting:** –

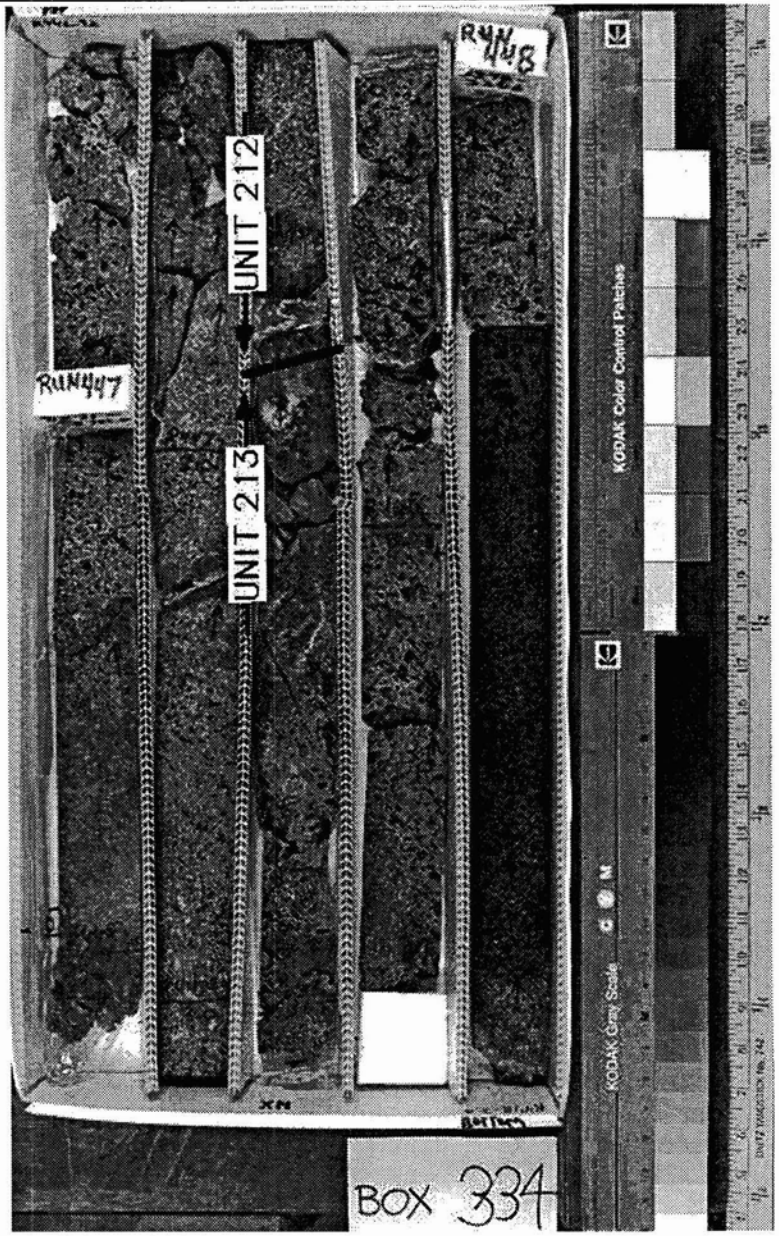
Vesicles: 20-30% – <1 to 10 mm – sub-rounded to sub-angular – equant –

Alteration: fresh (<2% altered) –

Veins: none

Fractures: moderate; yellowish clays (?) on some fracture surfaces

Additional comments:
NaCl ppt



Box #: 335

Cores in box
448
449

Loggers: EMS
Date logged: 12/11/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3281.1
Driller's depth:bottom [feet]: 3290.6
Core type: NQ

Units in box: 4

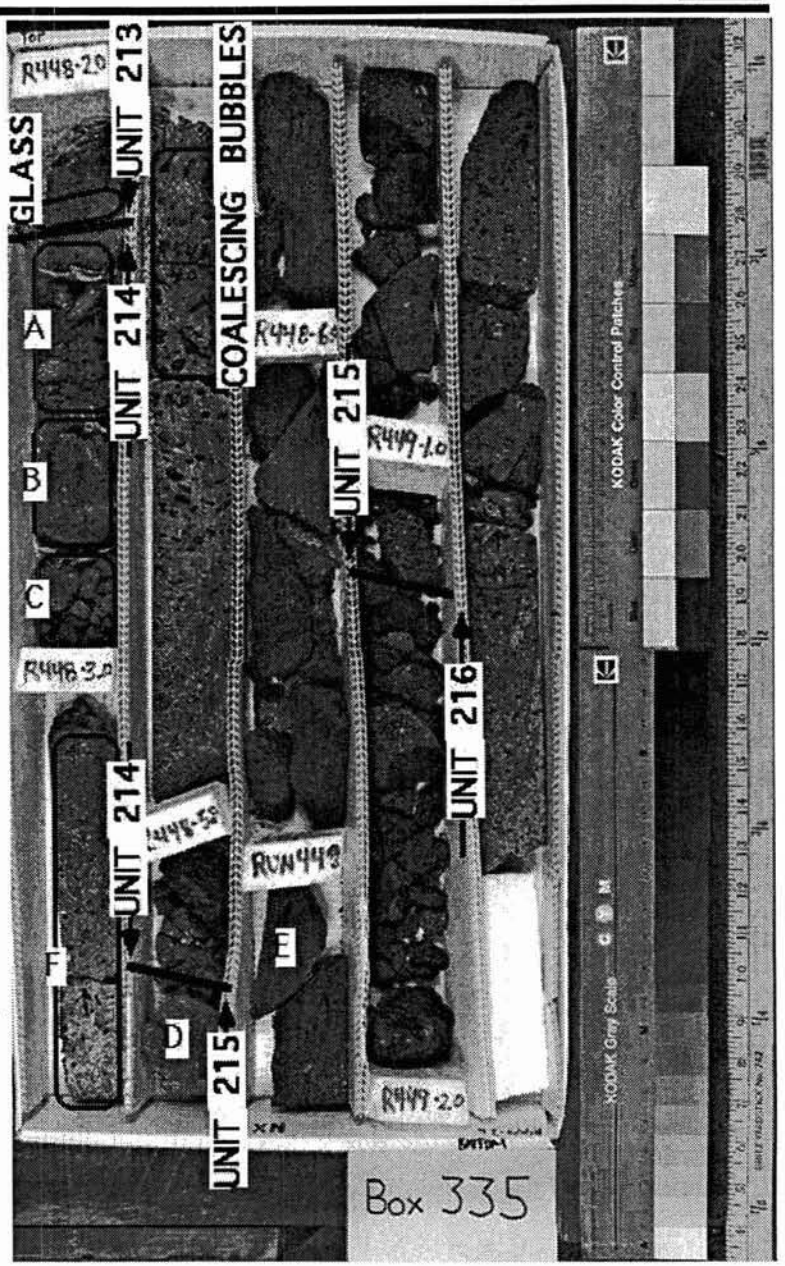
BOX UNIT 1: sparsely olivine phyric basalt — UNIT #: 213

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R448-2.3-**3280.3**')(flow contact)
glass at contact
Unit type: pahoehoe
from observation of previous box
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1-2% – 1-5 mm – equant-rounded –
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: glassy to microcrystalline –
Color: 5YR 6/1 light brownish gray to 5YR 4/1 brownish – **Structures:** – **Sorting:** –
Vesicles: 10-20% – <1 mm – sub-rounded to sub-angular – equant –
Alteration: moderately (10-40% altered) –
Veins: none
Fractures: rubble
Additional comments:
glass fragments along bottom contact; NaCl ppt; microgabbro inclusions

BOX UNIT 2: moderately olivine phyric basalt — UNIT #: 214

Contacts: Top (ft): (R 448-2.3-**3280.3**')(flow contact)
Bottom (ft): (R448-5.2-**3283.2**')(flow contact)
lithology change and red rubble zone at contact
Unit type: pahoehoe
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 3-6% – 1-5 mm – equant/rounded –
100 pts counted at R448-4.5
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N5-N6 medium to medium light gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – highly variable (<1 to >10 mm) – sub-rounded – horizontally elongated –
Vesicle distribution is highly irregular: small at top and bottom, but larger, coalescing vesicles in the middle.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: whitish/yellow mineral coating fracture (F)
Additional comments:
The top of this unit has been sub-divided as follows (keyed to photo): (A) brown-olivine-red dirt or solid, containing rock (up to 2 cm) and mineral fragments down to fine sandy material; (B) below the soil is a fragment of lava that looks like the solid lava that makes up the bulk of this unit (from R448-3.0), but it looks like it has a flow boundary at its bottom, possibly with glass fragments - could this be a very thin internal flow unit? (C) dirt or broken up, highly oxidized material that is reddish brown and crumbly, but it is more coherent in the archive box - is this more soil or just very decrepitated basalt?

BOX 335 CONTINUED ON NEXT PAGE



Box #:	Cores in box
335	448 449

Loggers:	EMS
Date logged:	12/11/93
Checked by:	MG
Check date:	12/14/93

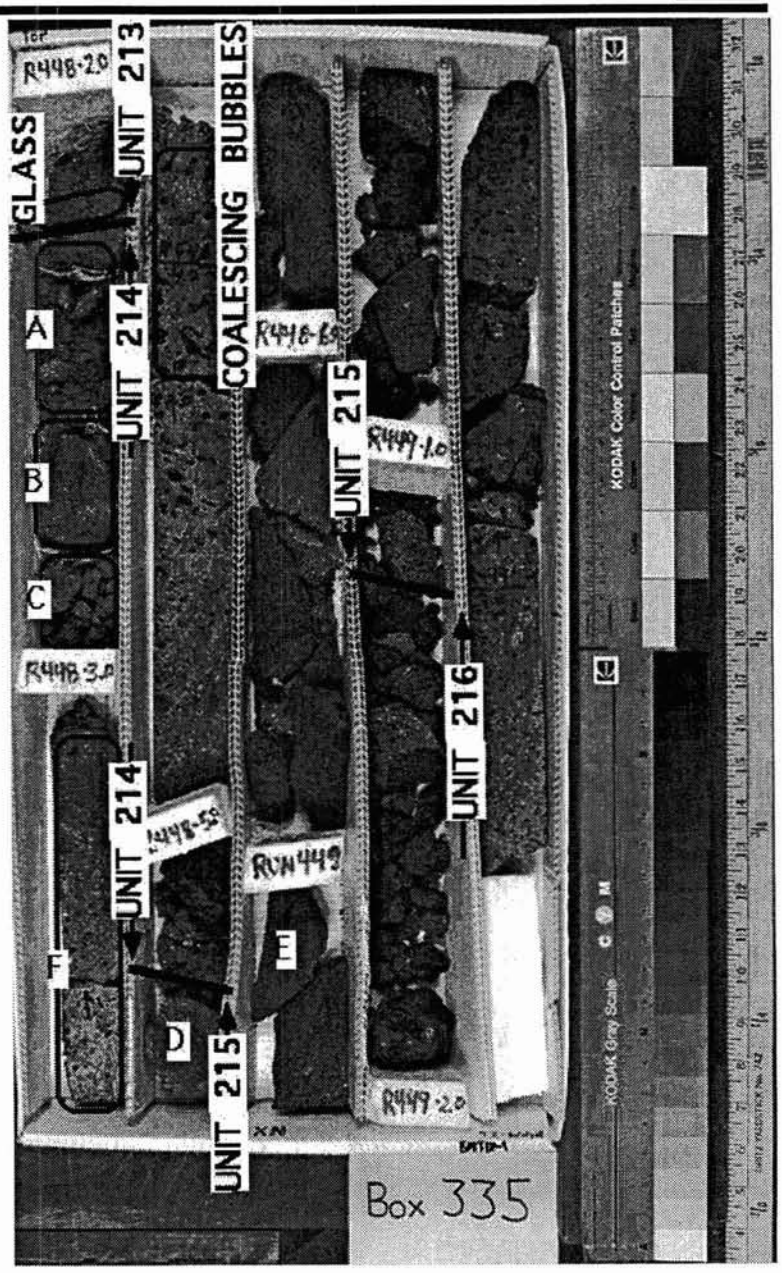
Driller's depth:top [feet]:	3281.1
Driller's depth:bottom [feet]:	3290.6
Core type:	NQ
Units in box:	4

BOX UNIT 3: moderately plagioclase-olivine phyric basalt — UNIT #: 215

Contacts: Top (ft): (R 448-5.2-3283.2')(flow contact)
Bottom (ft): (R449-1.2-3287.2')(flow contact)
Top is defined by a red, baked, altered fragment 0.1' long (D in photo), changes in vesicle content and structure, and changes in phenocryst abundance.
Unit type: pahoehoe
Phenocrysts/Clasts:
moderately phyric (2-10%) – highly variable, from an occasional phenocryst in some pieces, to up to ~10% in others
olivine – ~2% – 1-5 mm – equant –
plagioclase – <1% – 1 mm – laths –
seen on the cut and cored surfaces of fragment E
– – – –
Groundmass/Matrix: microcrystalline (possible glass, see cut face of – fragment E)
Color: N5 medium gray, but variable to reds and browns– **Structures:** – **Sorting:** –
Vesicles: 20-30% – <2 mm – spherical – equant–
Fe-oxides/hydroxide coatings on vesicle linings
generally evenly distributed
Alteration: moderately (10-40% altered) –
red/brownish in places
Veins: none
Fractures: rubble
Additional comments:
NaCl ppt

BOX UNIT 4: moderately olivine phyric basalt — UNIT #: 216

Contacts: Top (ft): (R 449-1.2-3287.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
rubbly top, red/brown fragments
Unit type: transitional/pahoehoe
Phenocrysts/Clasts:
moderately phyric (2-10%) – plagioclase microphenocrysts (~0.5 mm)
olivine – ~2% – 1-5 mm – equant/rounded –
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 medium gray– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded to sub-angular – 1:1 to 7:1–
(1) In addition to the large vesicles, there is a population of much smaller (<1 mm) vesicles between them. (2) The larger vesicle population is partially filled with brown microcrystalline material, variably altered to Fe-oxide/hydroxides -- formed from liquid from groundmass?
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly to moderately
Additional comments:



Box #:	Cores in box
336	449 450 451

Loggers:	TJ
Date logged:	12/10/93
Checked by:	MG
Check date:	12/14/93

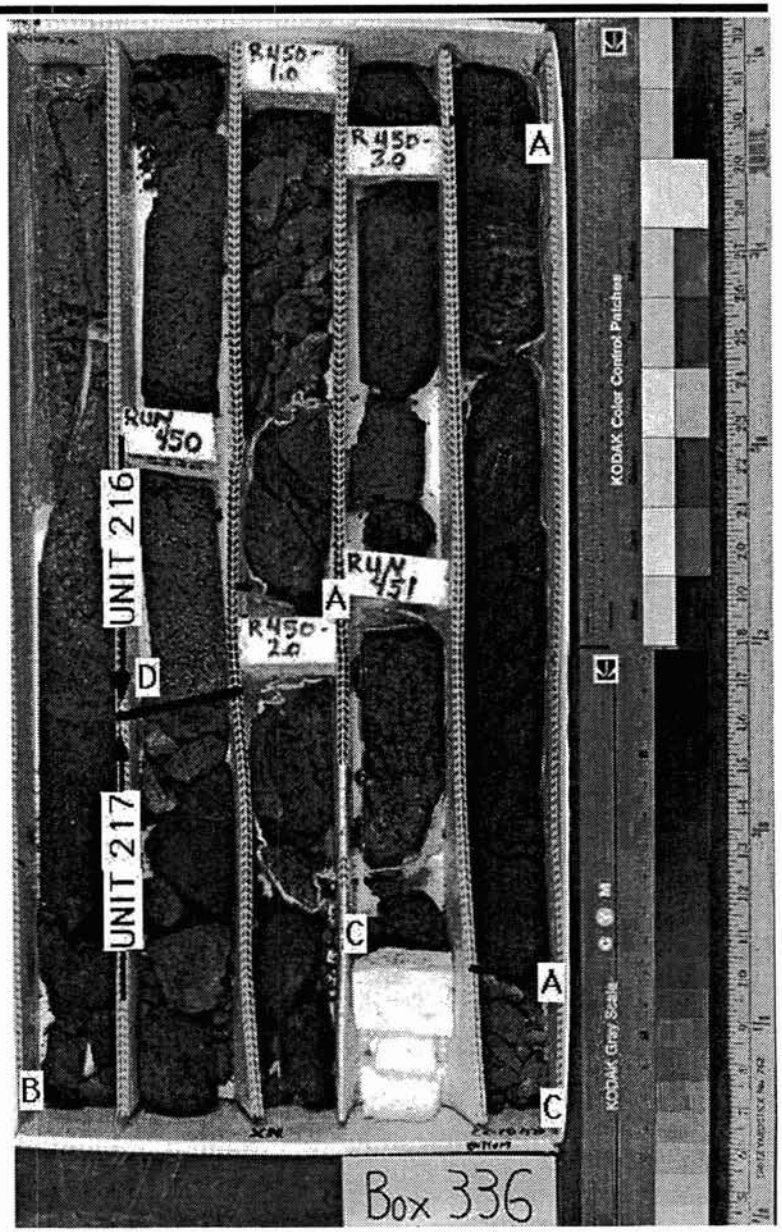
Driller's depth:top [feet]:	3290.6
Driller's depth:bottom [feet]:	3301.3
Core type:	NQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 216

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R450-0.5-3293.5')(flow contact)
Bottom contact: Highly oxidized rubble with some soil. Vesicle size decreases. Marked D on photo.
Unit type: transitional - pahoehoe
abundant vesicles - mostly equant, some angular or elongated
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2-5% – 1-5 mm – blocky (<3:1:1) – iddingsite
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded to angular – equant to elongated (various orientations) –
Vesicles highly variable in size near base of flow.
Alteration: fresh to slightly (<2-10% altered) – groundmass oxidation
Veins: none
Fractures: weakly fractured: 3/3.3', excluding rubble zones at R449, 5.0-5.4, marked B on photo.
Additional comments:
NaCl ppt

BOX UNIT 2: moderately plagioclase-olivine phyric basalt — UNIT #: 217

Contacts: Top (ft): (R 450-0.5-3293.5')(flow)
Bottom (ft): (R--')(continuous with next box)
small amount of soil at top contact
Unit type: transitional
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 3% – 1-5 mm – equant –
olivines oxidized to black
plagioclase – <1% – 1 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: blackish red – **Structures:** – **Sorting:** –
Vesicles: 15-40% – 1-5 mm – rounded to angular – equant to elongated –
Alteration: moderately (10-40% altered) – groundmass oxidation
pervasive oxidation throughout
Veins: none
Fractures: highly fractured: 22/2.2 ft
Additional comments:
NaCl ppt. Abrupt changes in vesicle size and shape (internal flow contacts) at several points, labeled A on photo.



Box #: 337

Cores in box
451
452

Loggers: MBB
Date logged: 12/10/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3301.3
Driller's depth:bottom [feet]: 3310.6
Core type: NQ

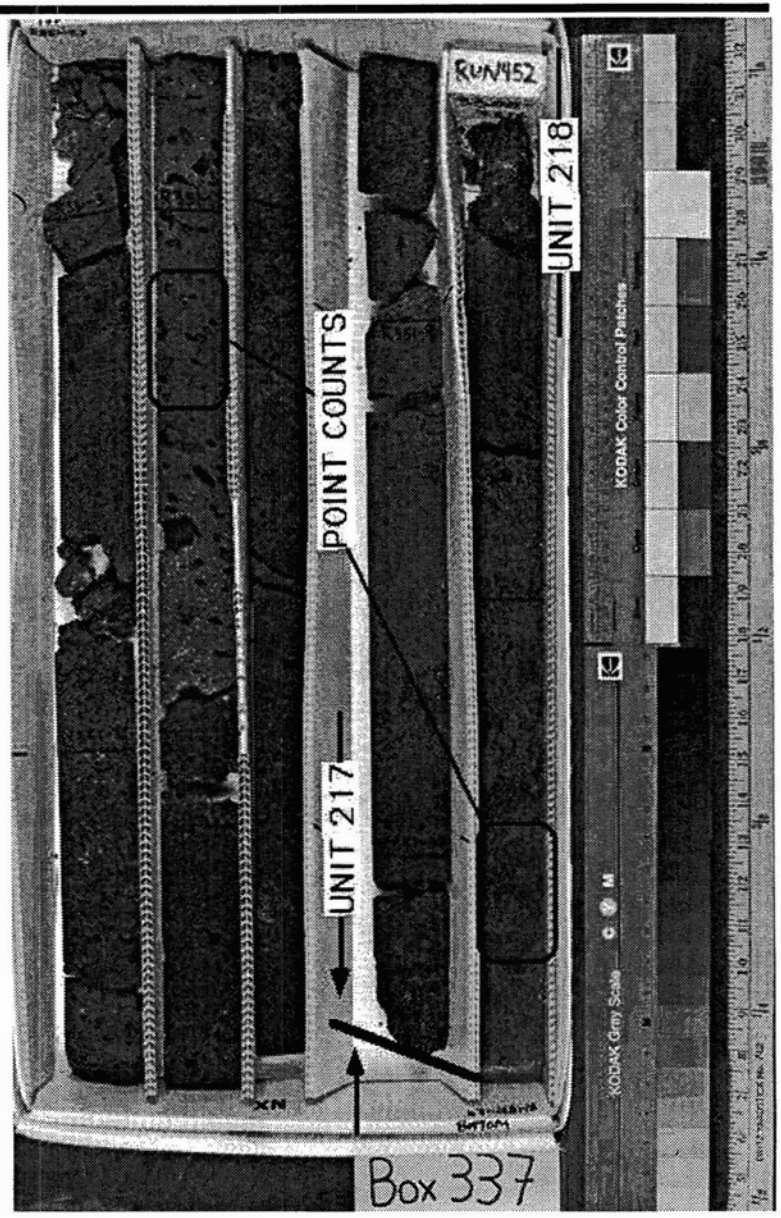
Units in box: 2

BOX UNIT 1: sparsely plagioclase-olivine phyric basalt — UNIT #: 217

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R451-10.4-**3307.1**')(flow contact)
lithologic change
Unit type: massive
Core has pahoehoe characteristics between R451-3.0 and R451-9.0; below R451-9.0, unit appears to be aa.
Phenocrysts/Clasts:
sparsely phyric (1-2%) –
olivine – 1% – 1-2 mm – equant –
1% at R451-5.4; 1% at R452-1.6; no obvious spinel inclusions in the olivine phenocrysts; olivines are completely to highly oxidized, some iddingsite.
plagioclase – <1% – 1-2 mm – tabular (>3:1:1) –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 med. dk. gray - freshest piece – **Structures:** – **Sorting:** –
Vesicles: 5-30% – <1-5 mm – rounded to angular – equant to elongate –
rounded to subrounded above R451-9.0; subangular to angular below; in the least oxidized portions, the oxidation is localized around the vesicle surfaces
Alteration: slightly to completely (2-100% altered) – groundmass oxidation
Core is also weakly oxidized throughout the interval R451-9.0 to R452-1.0.
Veins: none
Fractures: weakly fractured: 15/9.7 ft, groundmass is more oxidized along fractures
Additional comments:
NaCl ppt; olivine microphenocrysts, rare plagioclase microphenocrysts

BOX UNIT 2: aphyric basalt — UNIT #: 218

Contacts: Top (ft): (R 451-10.4-**3307.1**')(flow contact)
Bottom (ft): (R--')(continuous with next flow)
Unit type: aa
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-3 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-3 mm – sub-angular – irregular –
Alteration: slightly (2-10% altered) –
Veins: none
Fractures: weakly: 1/2 ft
Additional comments:
NaCl ppt



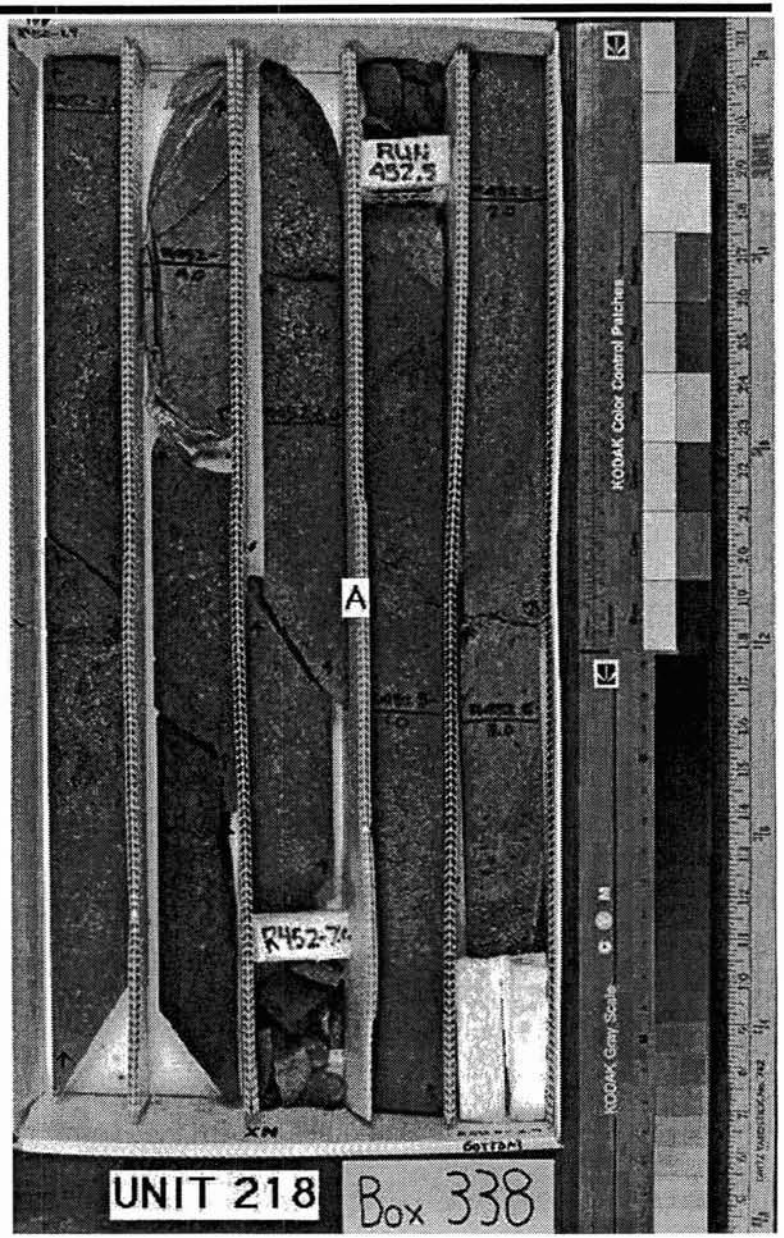
Box #:	Cores in box
338	452

Loggers:	LLW
Date logged:	12/11/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3310.6
Driller's depth:bottom [feet]:	3319.4
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric to sparsely olivine phyric basalt **UNIT #:218**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric to sparsely phyric (<1-2%) –
olivine – <1% to 1% – 1-3 mm – equant – iddingsite, oxidation
phenocrysts rare
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: ~5% – 1 mm – sub-angular to angular – horizontally to vertically elongated – oxidation
vesicularity variable throughout unit
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 10/9 ft; does not include small rubbly zone from R452-7.0 to R452.5-0.0; some fracture surfaces oxidized
Additional comments:
NaCl ppt; fine-grained dunite clast @ R452-6.25 on back of core (marked "A" on photo)



Box #: 339

Cores in box: 452, 453

Loggers: LLW
Date logged: 12/11/93
Checked by: MG
Check date: 12/14/93

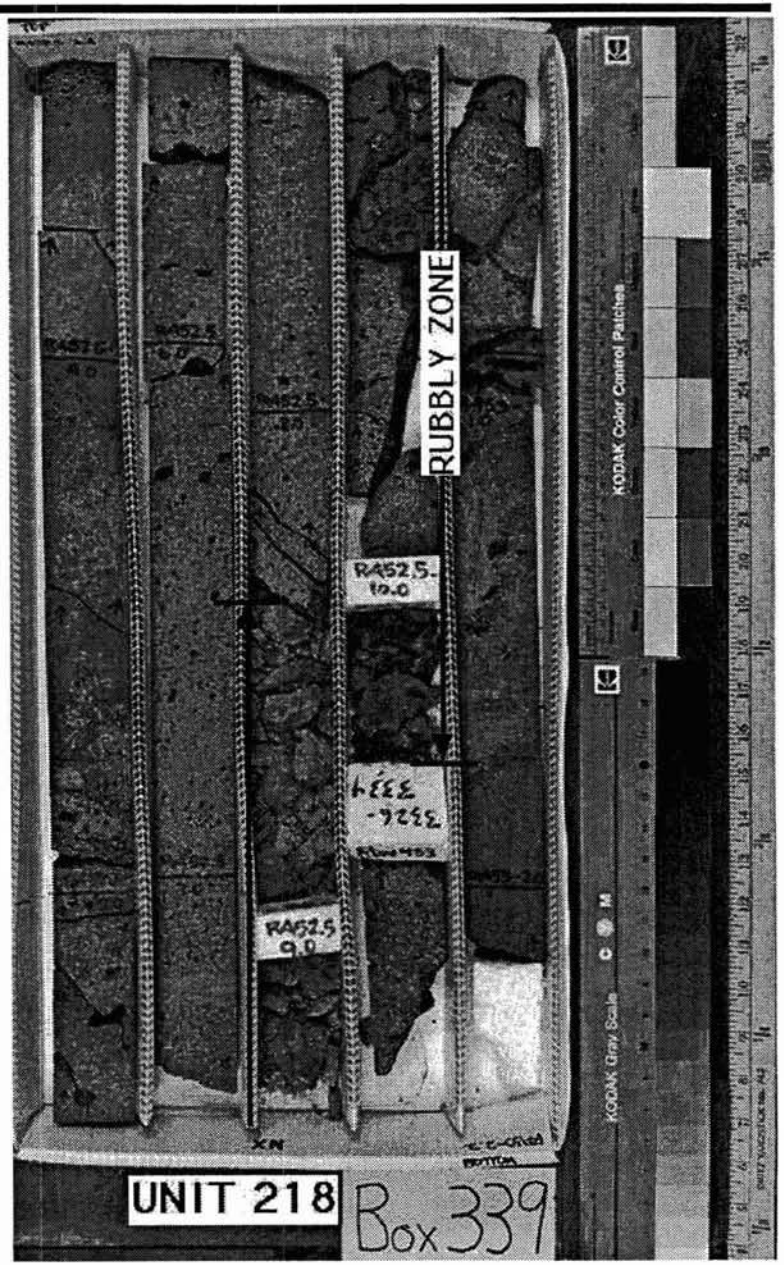
Driller's depth:top [feet]: 3319.4
Driller's depth:bottom [feet]: 3330.8
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric to sparsely olivine phyric basalt

UNIT #:218

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
rubbly from R452.5-8.4 to R453-0.0 but no evidence for a time break
Unit type: massive
Phenocrysts/Clasts:
aphyric to sparsely phyric (<1-2%) –
olivine – <1% to 1% – 1-5 mm – equant to tabular – iddingsite
phenocrysts rare
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: ~5% – <1-10 mm – sub-rounded to angular – equant to elongate–
oxidation
Larger vesicles are subrounded, smaller vesicles are sub-angular to angular; elongate vesicles range from horizontal to vertical, two generations of vesicles.
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 14/6.6 ft; excludes rubbly zone from R452.5-8.4 to R453-0.0
Additional comments:
minor NaCl ppt



Box #:	Cores in box
340	453 454 455

Loggers:	TJ
Date logged:	12/11/93
Checked by:	MG
Check date:	12/14/93

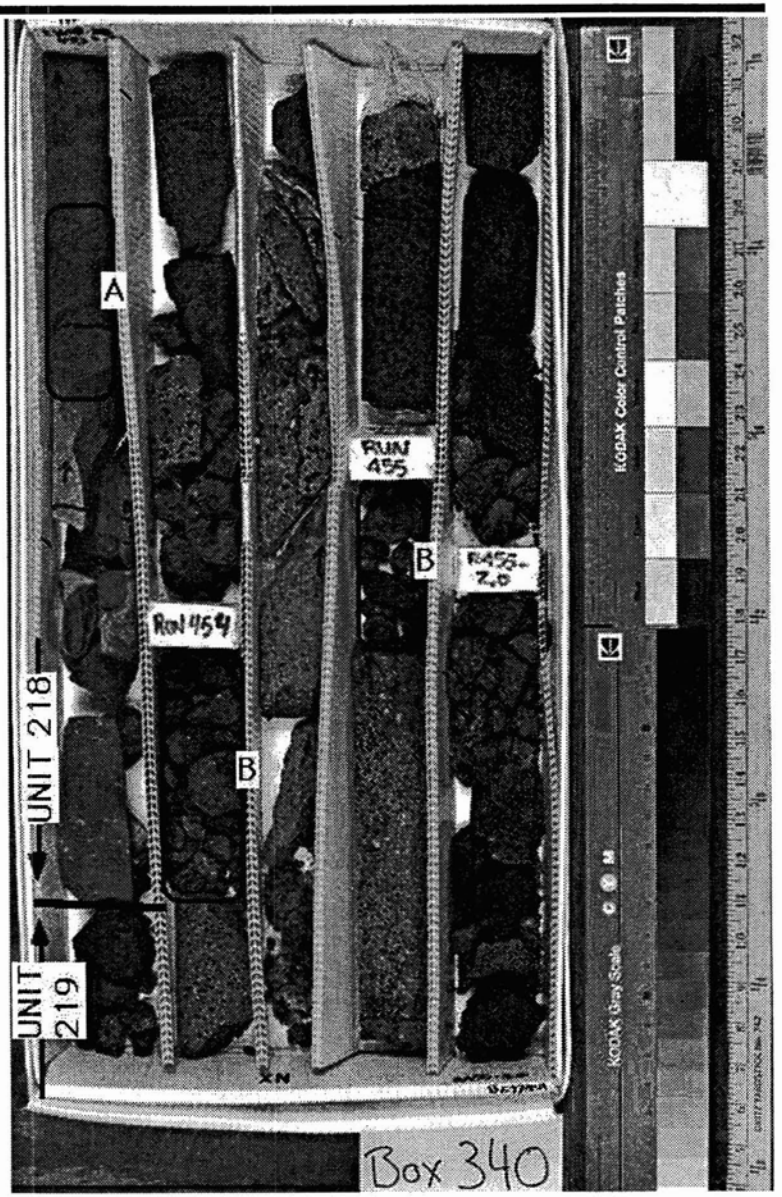
Driller's depth:top [feet]:	3330.8
Driller's depth:bottom [feet]:	3338.5
Core type:	NQ
Units in box:	2

BOX UNIT 1: moderately olivine phyric basalt — UNIT #: 218

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R453-3.7-3329.9')(flow contact)
Bottom contact: massive, relatively fresh lava over oxidized, more vesicular lava
Unit type: aa
relatively few vesicles with horizontal elongation
Phenocrysts/Clasts:
moderately phyric (2-10%) –
olivine – 2% – 1-3 mm – anhedral – Mn oxides
5-10% olivine microphenocrysts
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 0.5 mm – angular – equant –
Alteration: slightly to moderately (2-40%) altered – groundmass oxidation
nearly fresh except one more oxidized, marked A on photo
Veins: none
Fractures: moderately fractured: 8/1.6 ft
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 219

Contacts: Top (ft): (R 453-3.7-3329.9')(flow)
Bottom (ft): (R--')(continuous with next box)
Oxidized top of flow overlain by more massive, less altered lava.
Unit type: pahoehoe
Abundant, rounded vesicles.
Phenocrysts/Clasts:
aphyric (<1%) – sparse, anhedral olivine phenocrysts and microphenocrysts
olivine – <1% – 1-2 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – sub-rounded – equant –
Alteration: slightly (2-10% altered) – groundmass oxidation
Veins: none
Fractures: highly fractured/rubbly except weakly fractured from R454-0.9 to R455-1.4
Additional comments:
NaCl ppt. Possible caved material at top of run 454 (0.0-0.4) and top of run 455 (0.0-0.3). Vesicular oxidized rubble in these zones, marked B on photo.



Box #: 341

Cores in box
455
456

Loggers: LLW
Date logged: 12/11/93
Checked by: MG
Check date: 12/14/93

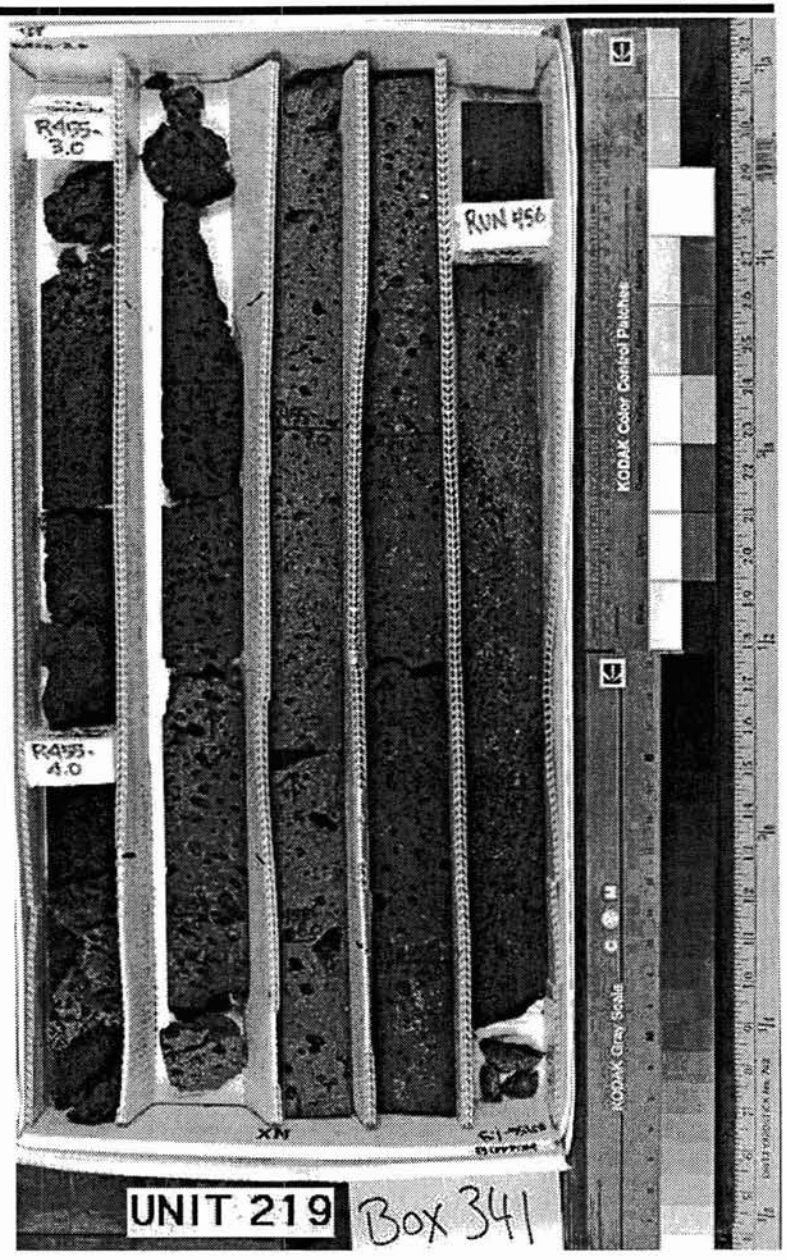
Driller's depth:top [feet]: 3338.5
Driller's depth:bottom [feet]: 3347.1
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:219

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: pahoehoe
abundant rounded to sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-2 mm – equant –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-5 mm – spherical to sub-rounded – equant–
oxidation
occasional horizontally elongate vesicles
Alteration: fresh (<2% altered) –
Veins: none
Fractures: moderately fractured - R455-3.0 to R455-6.4; weakly fractured - R455-6.4 to R456-1.3; fracture surfaces oxidized and occasionally coated with yellow-orange clay
Additional comments:
NaCl ppt



Box #: 342

Cores in box
456
457

Loggers:	TJ
Date logged:	12/11/93
Checked by:	MG
Check date:	12/14/93

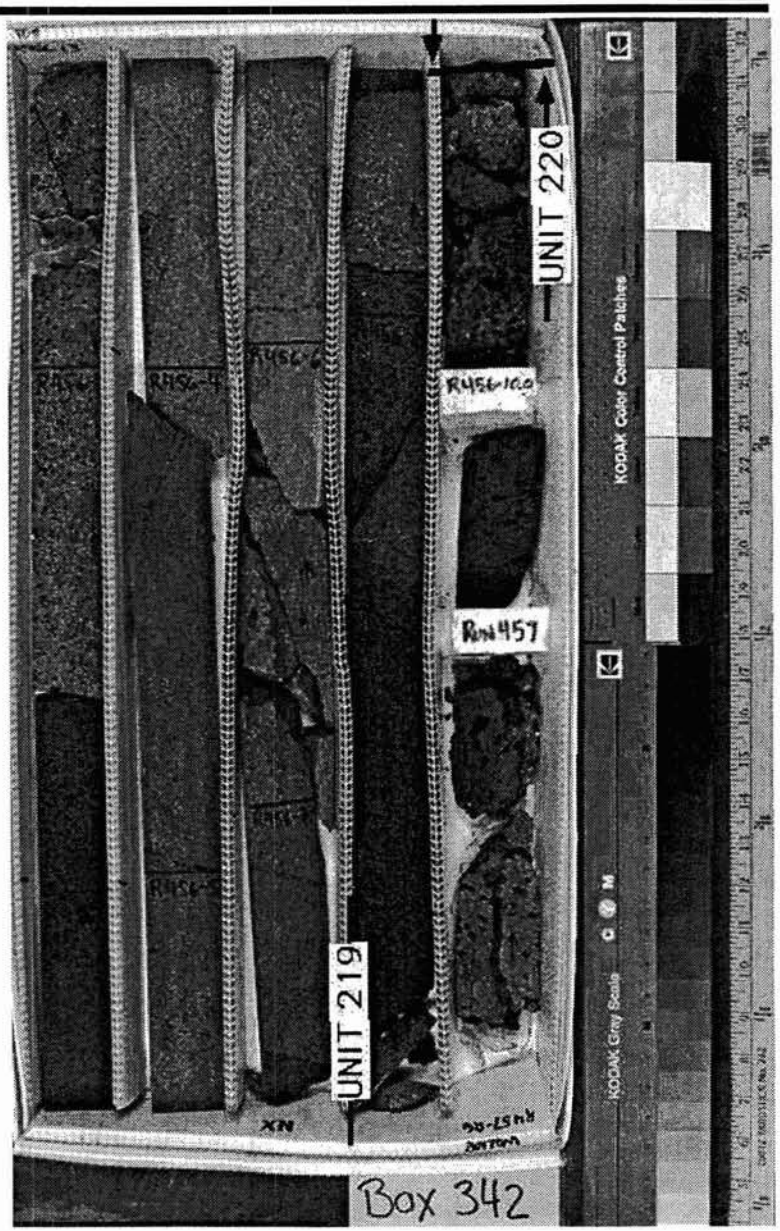
Driller's depth:top [feet]:	3347.1
Driller's depth:bottom [feet]:	3356.3
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 219

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R456-9.4-3356.5')(flow contact)
Bottom: friable, non-vesicular layer overlies brown soil (some glass)
Unit type: pahoehoe
abundant rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) – 5% olivine microphenocrysts
olivine – <1% – 1-2 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: grayish black – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 0.2-2 mm – spherical to subrounded – equant –
Alteration: fresh (<2% altered) –
oxide coatings in vesicles, bottom 2" of unit
Veins: none
Fractures: weakly fractured: 10/8.0 ft
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 220

Contacts: Top (ft): (R 456-9.4-3356.5')(flow contact)
Bottom (ft): (R--')(continuous with next box)
1" of friable soil at top
Unit type: pahoehoe
abundant large rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) – 5% olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: 5YR 2/2 dusky brown – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 5-7 mm – spherical – horizontally elongated –
Alteration: moderately (10-40% altered) – groundmass oxidation
pervasive oxidation
Veins: none
Fractures: moderately fractured: 11/1.8 ft
Additional comments:
NaCl ppt



Box #: 343

Cores in box: 457

Loggers:	MBB
Date logged:	12/11/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3356.3
Driller's depth:bottom [feet]:	3365.6
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt

UNIT #:220

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: massive
core with large, rounded vesicles (pahoehoe-type) which grades into massive material by R457-4.0

Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – ~1 mm – equant –
Visual estimate of mode; olivine phenocrysts are fresh.
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –

Color: N4 + N5 – **Structures:** – **Sorting:** –

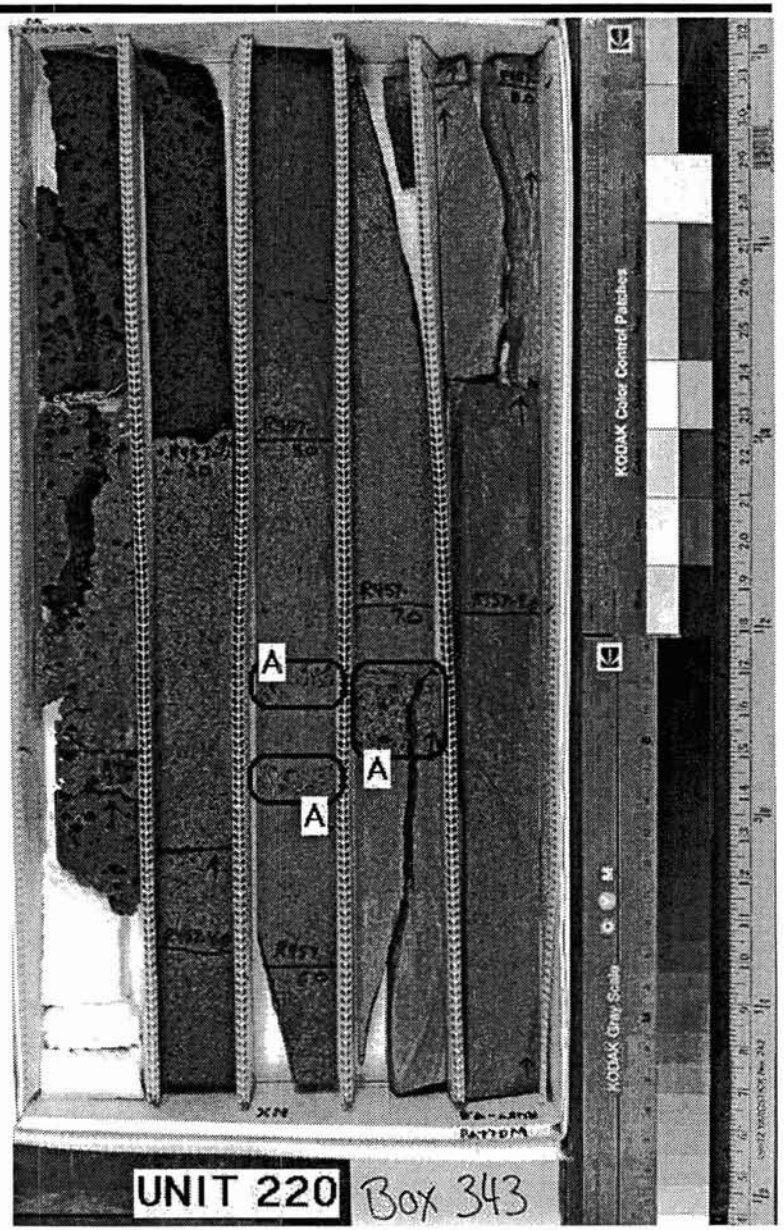
Vesicles: 10-15% – <1-8 mm – rounded to angular – equant to elongate –
Vesicle size decreases from top of box (R457-0.5) to R457-4.0 where a majority of the vesicles are ≤1 mm; below R457-7.3, vesicles are all <1 mm; zone between R457-7.3 and R457-8.3 has ~5% of <1 mm sized vesicles. Horizontal vesicle trains in the interval R457-3.0 to R457-5.0.

Alteration: fresh to moderately (<2-40% altered) – groundmass oxidation
Core is essentially fresh by R457-3.0.

Veins: possible segregation veins - labeled "A" on the photo; these veins are more coarsely grained and vesicular than the surrounding groundmass

Fractures: weakly fractured: 10/9.5 ft

Additional comments:
NaCl ppt



Box #:	Cores in box
344	457 458

Loggers:	LLW
Date logged:	12/11/93
Checked by:	MG
Check date:	12/14/93

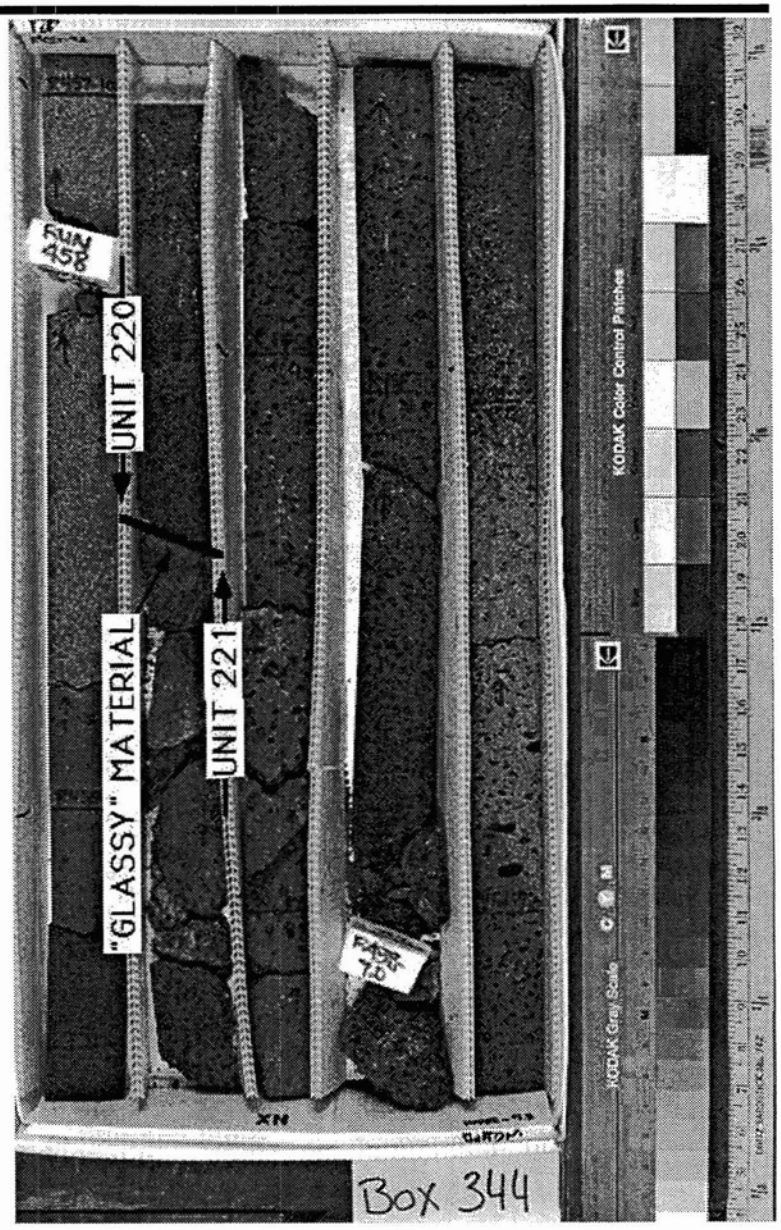
Driller's depth:top [feet]:	3365.6
Driller's depth:bottom [feet]:	3375.0
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 220

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R458-2.4-3369.9')(flow contact)
contact defined by vesicle size gradation, thin (1 mm) glass zone, and slightly weathered rubbly zone at top of unit 2; contact may be internal
Unit type: massive
"pahoehoe-like" vesicularity in bottom 0.5 ft
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – <1-3 mm – rounded to sub-rounded – equant–
oxidation
vesicle size and abundance increases towards contact
Alteration: fresh (<2% altered) –
Veins: some microcrystalline segregation veins of basalt at R458-0.0, R458-0.85, R458-1.25, R458-1.45
Fractures: weakly fractured: 4/2.7 ft
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 221

Contacts: Top (ft): (R 458-2.4-3369.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for top contact description
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 10-20% – 1-7 mm – sub-rounded – equant–
oxidation
occasional horizontally elongate vesicles; occasional vesicles to >1 cm
Alteration: slightly (2-10% altered) –
slight groundmass oxidation
Veins: none
Fractures: weakly fractured: 9/5.5 ft; excludes rubbly zones from R458-2.4 to R458-3.3 and R458-6.9 to R458-7.3
Additional comments:
NaCl ppt



Box #: 345

Cores in box
458
459

Loggers: TJ
Date logged: 12/11/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3375.0
Driller's depth:bottom [feet]: 3384.7
Core type: NQ

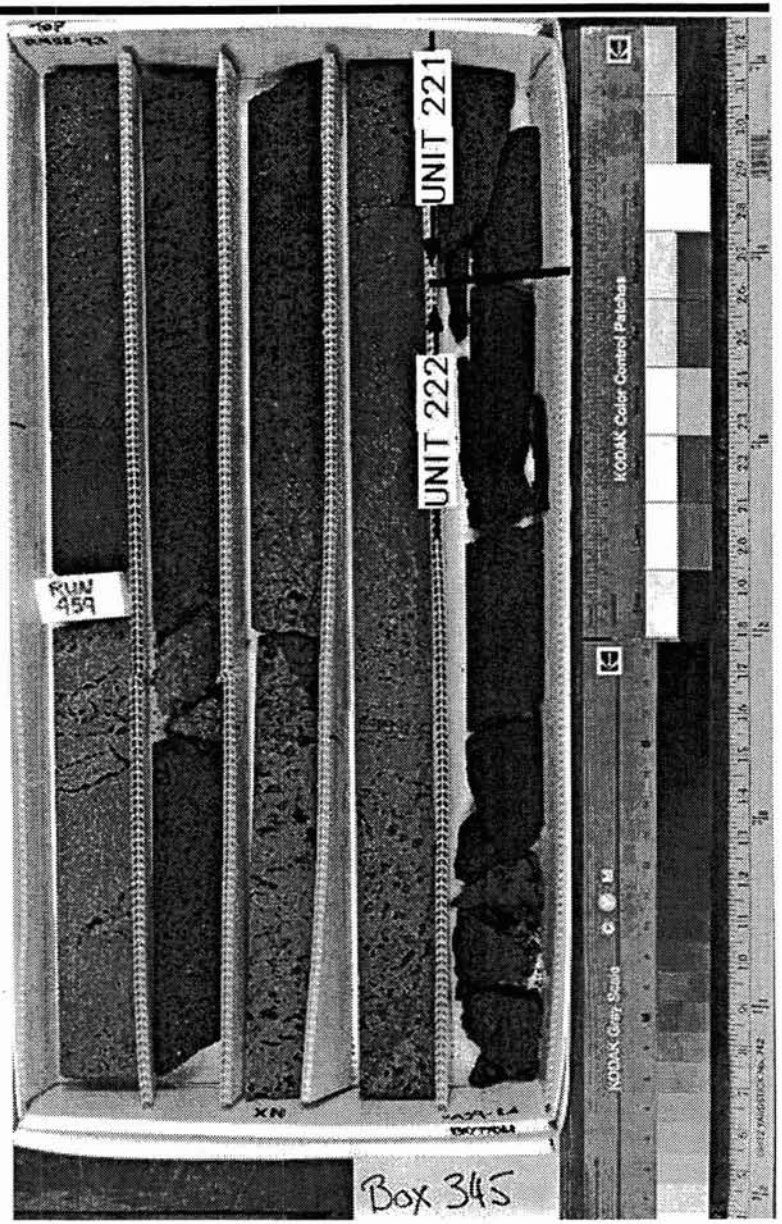
Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 221

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R459-7.1-3385.0')(flow contact)
Bottom contact: vesicles change size abruptly; unit below has oxidized vesicle surfaces; fluid-like glassy surface at base; no lithologic change.
Unit type: transitional
Variable vesicle morphology; large rounded to fine, angular, elongated.
Phenocrysts/Clasts:
aphyric (<1%) – 1-3% olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 0.2-5 mm – sub-rounded to angular – equant to horizontally elongated –
Alteration: fresh (<2% altered) –
oxide alteration on vesicle surfaces in bottom 1"
Veins:
Fractures: weakly fractured: 5/8.2 ft
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 222

Contacts: Top (ft): (R 459-7.1-3385.0')(flow)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for contact info. (possibly part of unit 1)
Unit type: pahoehoe
abundant rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) – sparse olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: dark gray– **Structures:** – **Sorting:** –
Vesicles: >30% – 1-5 mm – spherical to sub-angular – equant –
Alteration: fresh to slightly (<2-10% altered) – oxides
oxides on vesicle surfaces
Veins: none
Fractures: moderately fractured: 5/1.0 ft, excluding rubble zone in last 6" of box.
Additional comments:
NaCl ppt



Box #:	Cores in box
346	459 460

Loggers:	MBB
Date logged:	12/11/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3384.7
Driller's depth:bottom [feet]:	3395.5
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 222

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R460-4.0-3392.3')(flow contact)
flow contact not well defined; oxidation increases in the rubbly material (upper flow) going down towards the contact; rare "glassy" spines on the piece labeled "A" at the top of the bottom flow; no lithologic change, but matrix is coarser

Unit type: pahoehoe
classification based on vesicle morphology

Phenocrysts/Clasts:
aphyric (<1%) – no phenocrysts observed; olivine microphenocrysts are present in the unit

Groundmass/Matrix: fine-grained (<1 mm) –

Color: N4 – **Structures:** – **Sorting:** –

Vesicles: 1-30% – <1-5 mm – rounded to subrounded – equant to horizontally elongate –
Some vesicles in the interval R460-0.0 to R460-2.0 are ~1 cm in size (see photo for variation in vesicle size and abundance with position within the unit).

Alteration: fresh to moderately (<2-40% altered) – groundmass oxidation
Groundmass oxidation increases below R460-3.0 (to the contact); from R459-8.6 (top of box) to R460-0.5, groundmass oxidation is localized to the <<1 mm vesicles.

Veins: none

Fractures: weakly fractured: 16/5.5 ft; fracture surfaces are zones of increased groundmass oxidation

Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 223

Contacts: Top (ft): (R 460-4.0-3392.3')(flow contact)
Bottom (ft): (R--')(continuous with next box)
see unit 1 for contact description

Unit type: pahoehoe
classification based on vesicle abundance and morphology

Phenocrysts/Clasts:
aphyric (<1%) – no phenocrysts observed

Groundmass/Matrix: fine-grained (<1 mm) –

Color: 5YR 3/2 grayish brown – **Structures:** – **Sorting:** –

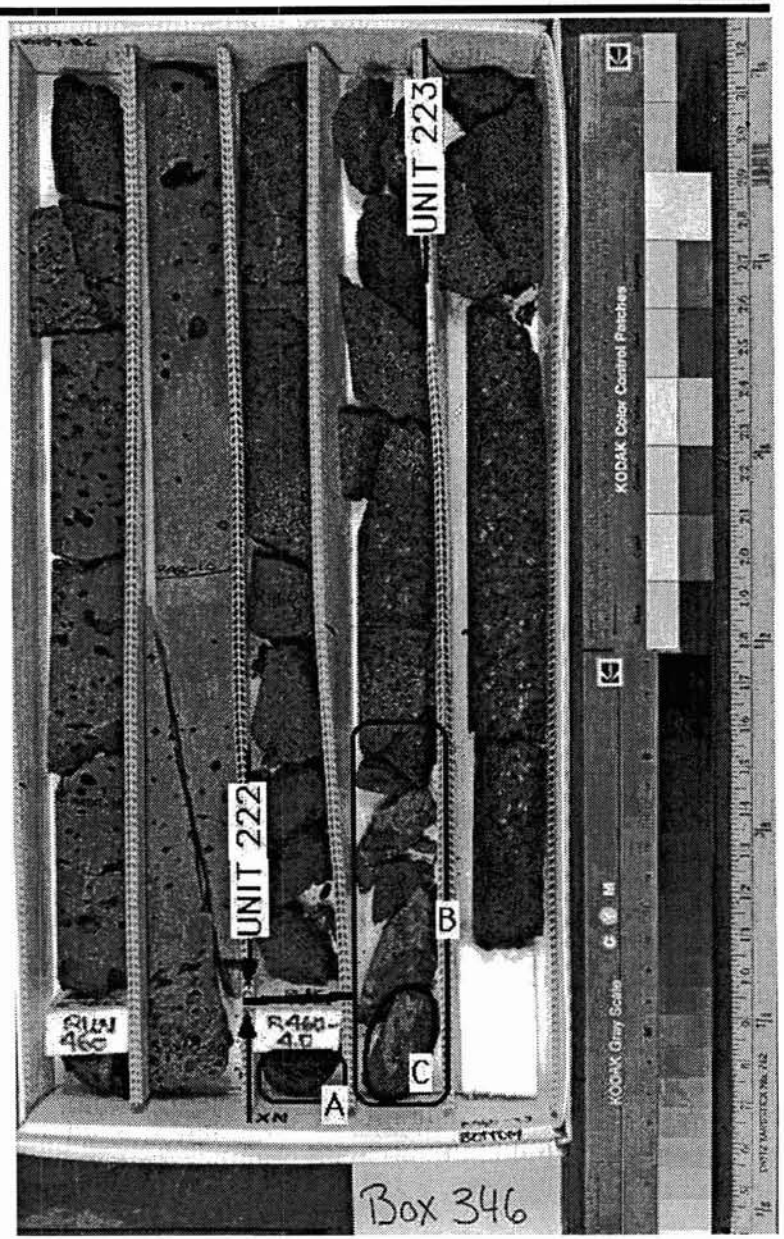
Vesicles: 15-30% – <1-3 mm – rounded to subrounded – equant –
Vesicle size increases with distance away from the contact.

Alteration: moderately to completely (10-100% altered) – groundmass oxidation
Extent of groundmass oxidation decreases away from the contact (see photo).

Veins: none

Fractures: moderately fractured: 12/3 ft; measurement doesn't include highly fractured zone labeled "B" in the photo

Additional comments:
NaCl ppt; plagioclase and olivine microphenocrysts
see photo: "C" = remnant of slickensides



Box #:	Cores in box
347	460 461

Loggers:	TJ
Date logged:	12/11/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3395.5
Driller's depth:bottom [feet]:	3402.6
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:223**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
internal contacts (glassy rinds, oxidized groundmass) at R461-2.1, R461-4.7, and R461-7.0 (see photo)
Unit type: pahoehoe
abundant rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: –
Color: grayish black – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-5 mm – rounded to sub-rounded – equant–
Vesicles smaller near internal contacts.
Alteration: slightly (2-10% altered) – groundmass oxidation
Alteration moderate (reddish color) near internal contacts.
Veins: none
Fractures: weakly fractured: 13/8.5 ft, excluding rubble near internal contacts
Additional comments:
NaCl ppt

Box #:	Cores in box
348	461 462

Loggers:	TJ
Date logged:	12/12/93
Checked by:	MG
Check date:	12/14/93

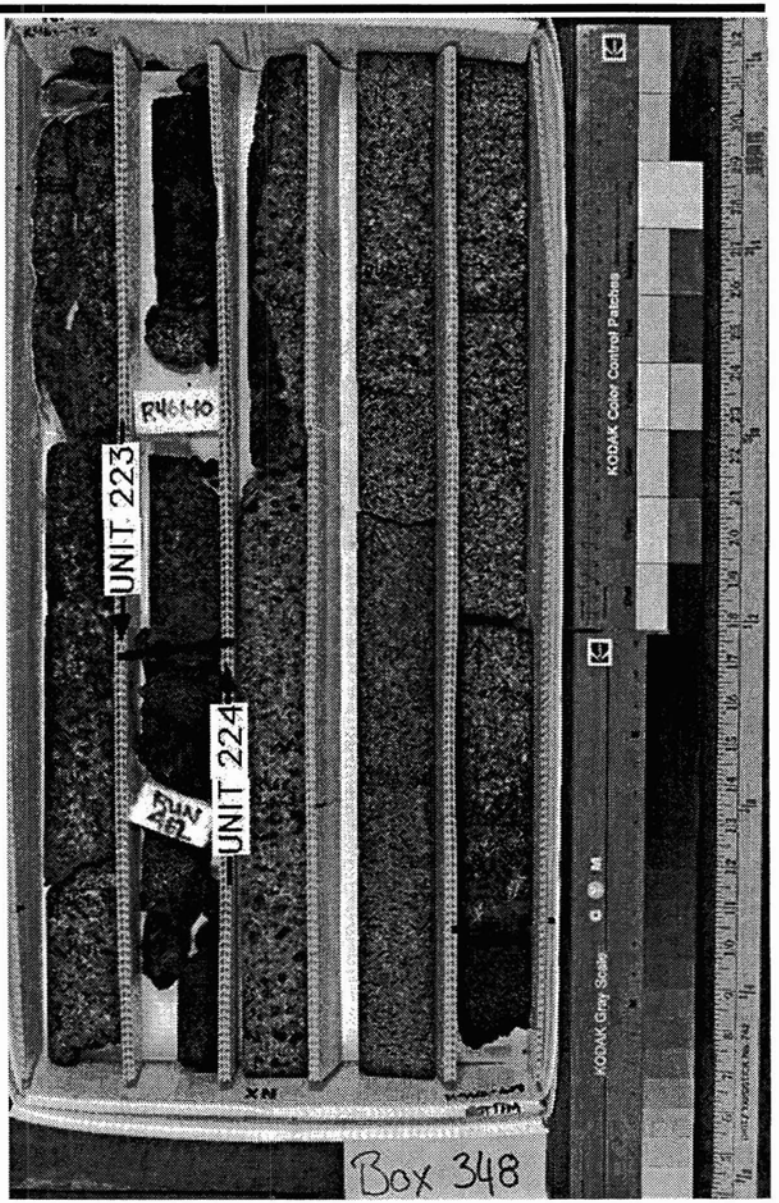
Driller's depth:top [feet]:	3402.6
Driller's depth:bottom [feet]:	3413.2
Core type:	NQ
Units in box:	2

BOX UNIT 1: aphyric basalt — UNIT #: 223

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R461-10.4-**3407.7**')(flow contact)
decrease in vesicle size, glassy rind above oxidized rubble zone (no soil); no lithologic change
Unit type: pahoehoe
abundant rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <<1% – ~1 mm – equant –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: grayish black – **Structures:** – **Sorting:** –
Vesicles: >30% – 1-5 mm – rounded to sub-rounded – equant –
Alteration: fresh to slightly (<2-10% altered) – groundmass oxidation
moderately altered (groundmass oxidation) in bottom 4"
Veins: none
Fractures: weakly fractured: 10/3.2 ft
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 224

Contacts: Top (ft): (R 461-10.4-**3407.7**')(flow contact)
Bottom (ft): (R--')(continuous with next box)
internal contact at R462-6.4; this unit could be part of unit 1
Unit type: transitional
abundant vesicles, rounded, except R462-4.0 to 5.5, angular, horizontally elongated
Phenocrysts/Clasts:
aphyric (<1%) –
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-7 mm – sub-rounded to angular – equant to horizontally elongated –
Vesicles rounded except R462-4.0 to 5.5, angular and horizontally elongated.
Alteration: fresh to slightly (<2-10% altered) –
Moderately altered, R462-6.0 to 6.4, near internal contact
Veins:
Fractures: weakly fractured: 4/5.8 ft; except near internal contact
Additional comments:
NaCl ppt



Box #:	Cores in box
349	462 463

Loggers:	MBB
Date logged:	12/12/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3413.2
Driller's depth:bottom [feet]:	3422.2
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:224**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)

Unit type: pahoehoe/transitional
classification based on the presence of equant, rounded vesicles as well as some sheared vesicle trains in the interval R462-9.7 to R463-5.0

Phenocrysts/Clasts:
aphyric (<1%) – no phenocrysts observed, but abundant olivine microphenocrysts present
– – – –
– – – –
– – – –

Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –

Color: N4 medium dark gray – **Structures:** – **Sorting:** –

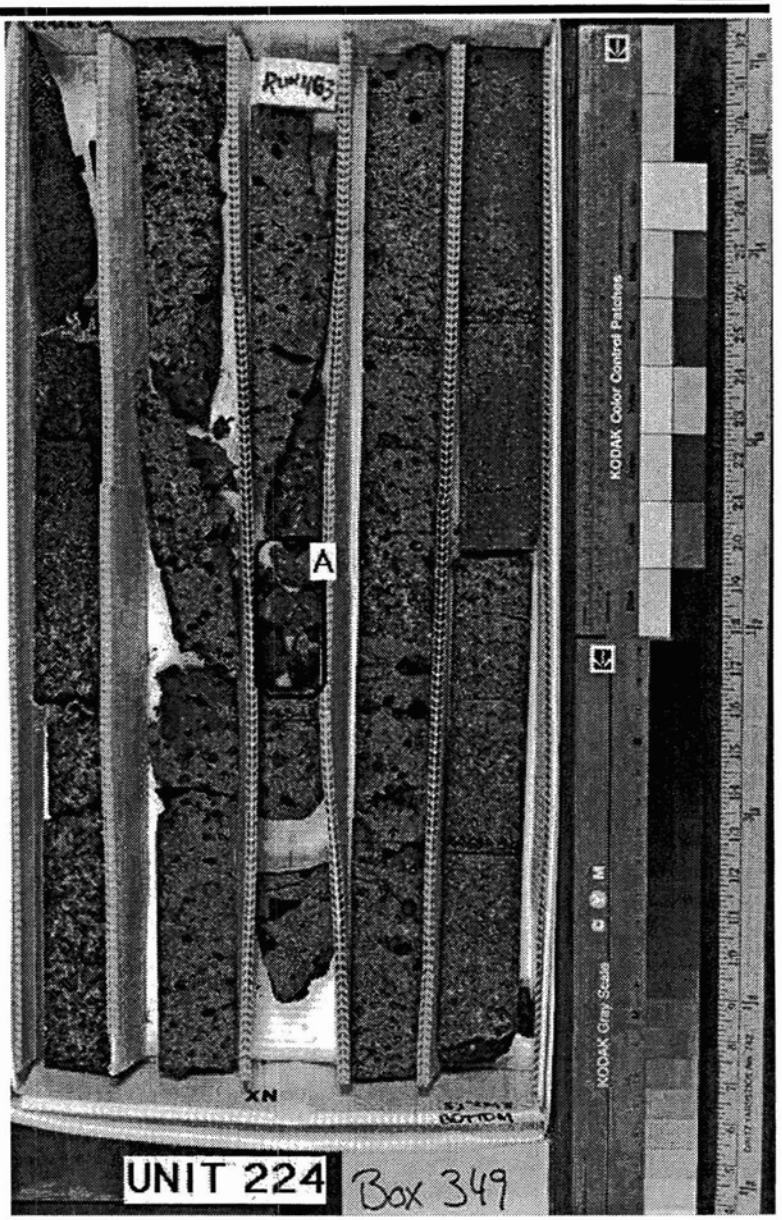
Vesicles: 5-20% – <1-10 mm – rounded to subrounded – equant to horizontally elongate –
Vesicle size increases and vesicle abundance decreases down section; angular <<1 mm vesicles are present below R462-8.5 and they are the only vesicles present below R463-4.6; some large >1 cm sized vesicles/vugs also present (see photo).

Alteration: fresh to slightly (<2-10% altered) – groundmass oxidation
Core is fresh below R462-8.0; below this level the groundmass oxidation is associated with the <<1 mm vesicles.

Veins: none

Fractures: weakly fractured: 14/9.3; doesn't include highly fractured zone labeled "A" in the photo; some fractures are surfaces of slightly greater groundmass oxidation

Additional comments:
NaCl ppt



Box #: 350

Cores in box
463
464

Loggers: TJ
Date logged: 12/12/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3422.2
Driller's depth:bottom [feet]: 3432.5
Core type: NQ

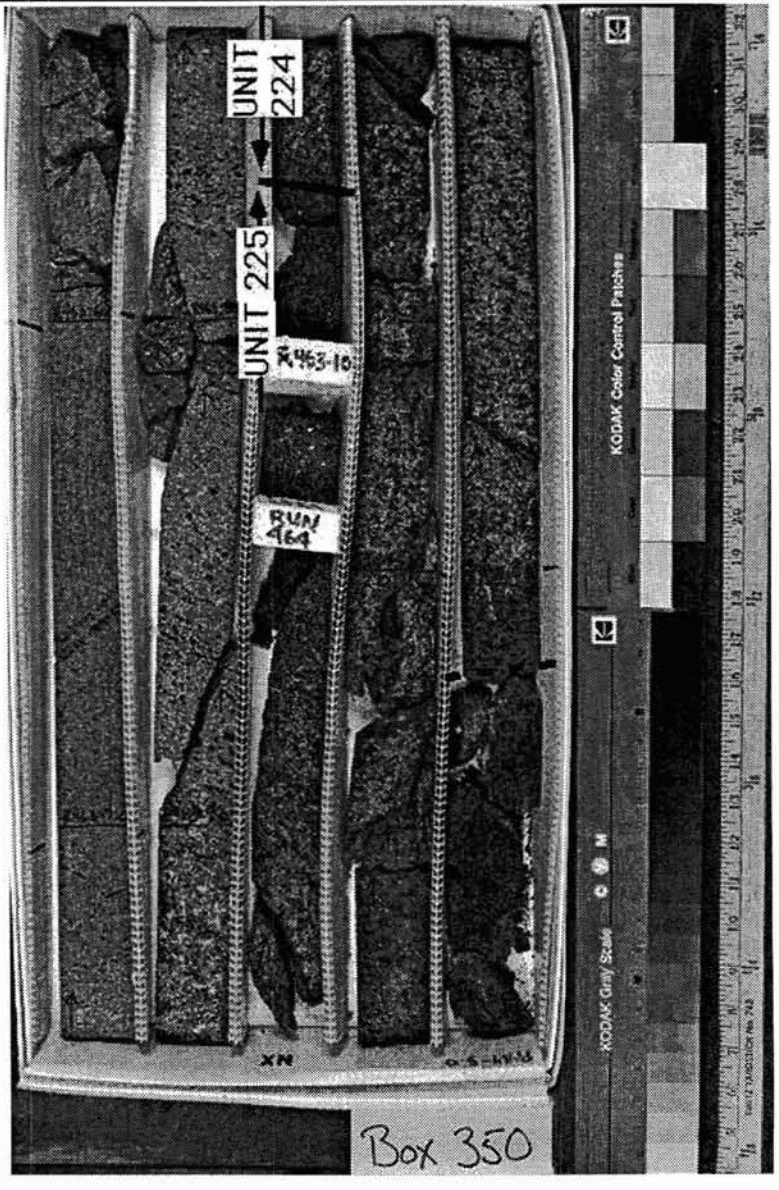
Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 224

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R463-9.7-3427.9')(flow contact)
bottom has finer vesicles and oxidized groundmass; overlies pahoehoe flow; no lithology change
Unit type: aa
relatively few vesicles, small and angular, often horizontally elongated
Phenocrysts/Clasts:
aphyric (<1%) – common olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N5 medium gray – **Structures:** – **Sorting:** –
Vesicles: 10-20% – 0.2-5 mm – angular to sub-rounded – horizontally elongated to equant–
in bottom 6", vesicles become large, rounded, and grade toward finer size near contact
Alteration: fresh to slightly (<2-10% altered) – groundmass oxidation
moderately altered in bottom 3"
Veins: none
Fractures: weakly fractured: 6/2.2 ft
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 225

Contacts: Top (ft): (R 463-9.7-3427.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
Top: see unit 1 (may be part of unit 1); internal flow contact at R464-4.2: thin glassy layer over highly altered zone
Unit type: pahoehoe
abundant rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) – common olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – rounded to sub-angular – equant–
Alteration: slightly to moderately (2-40% altered) – groundmass oxidation
alteration increases downward
Veins: none
Fractures: weakly fractured: 15/4.9 ft
Additional comments:
NaCl ppt



Box #: 351

Cores in box
464
465

Loggers: LLW
Date logged: 12/12/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3432.5
Driller's depth:bottom [feet]: 3442.5
Core type: NQ

Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 225

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R465-5.0-3442.9')(flow contact)
contact defined by weathered, microfractured zone and vesicle size gradation; may be internal flow contact
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) – common olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 5-25% – 1-10 mm – sub-rounded – equant –
near R464-7.7 vesicles are horizontally elongate; vesicle size and abundance variable
Alteration: fresh to slightly (<2-10% altered) –
slightly oxidized from R464-5.0 to R464-7.0; otherwise fresh
Veins: none
Fractures: rubbly from R464-5.0 to R464-6.6; otherwise weakly fractured (12/7.4 ft)
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 226

Contacts: Top (ft): (R 465-5.0-3442.9')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for top contact description.
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – 1-3 mm – equant – iddingsite
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: ~20% – 1-3 mm – sub-rounded – equant –
oxidation
Alteration: moderately (10-40% altered) –
moderate groundmass oxidation
Veins:
Fractures: moderate (see photo)
Additional comments:
only have top 0.5 ft of this unit in this box so descriptions are difficult

Box #: 352

Cores in box
465
466

Loggers: LLW
Date logged: 12/12/93
Checked by: MG
Check date: 12/14/93

Driller's depth:top [feet]: 3442.5
Driller's depth:bottom [feet]: 3451.6
Core type: NQ

Units in box: 2

BOX UNIT 1: aphyric basalt — UNIT #: 226

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R466-0.3-3448.2')(flow contact)
contact defined by vesicle size gradation, small glassy rind, and blue clay in vesicles of lower flow; internal contacts (glassy surface) at R465-7.7 and 9.0
Unit type: pahoehoe
abundant sub-rounded vesicles
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – <1% – <1-3 mm – equant – iddingsite
<1% @ R465-6.8; olivine microphenocrysts observed
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N3 dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – 1-3 mm – sub-rounded – equant–
slight oxidation
some vesicles slightly vertically elongated; vesicle size grades from larger to smaller towards contact
Alteration: slightly (2-10% altered) –
slight groundmass oxidation
Veins: none
Fractures: moderately: 16/3.5 ft; some yellow-white clays (?) coating fracture surfaces
Additional comments:
NaCl ppt

BOX UNIT 2: aphyric basalt — UNIT #: 227

Contacts: Top (ft): (R 466-0.3-3448.2')(flow contact)
Bottom (ft): (R--')(continuous with next box)
See unit 1 for top contact description.
Unit type: pahoehoe
Phenocrysts/Clasts:
aphyric (<1%) – common olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline –
Color: N4 medium dark gray– **Structures:** – **Sorting:** –
Vesicles: <5-10% – 1-10 mm – rounded to sub-rounded – equant–
see "additional comments"
Alteration: fresh (<2% altered) –
Veins: none
Fractures: moderately fractured from R465-9.0 to R466-0.7; weakly fractured from R466-0.7 to R466-4.6 (6/3.9 ft); fracture surfaces and vesicles coated with yellowish clay(?) and blue clay
Additional comments:
NaCl ppt
3 types of vesicle fillings observed: (A) colorless needles of zeolite; (B) blue to blue-green clay as vesicle coatings and fillings; (C) gray mud vesicle fillings (may be drillers' mud) - examples of each are circled on photo

Box #: **353**

Cores in box
466
467

Loggers: TJ
Date logged: 12/12/93
Checked by: MG
Check date: 12/14/93

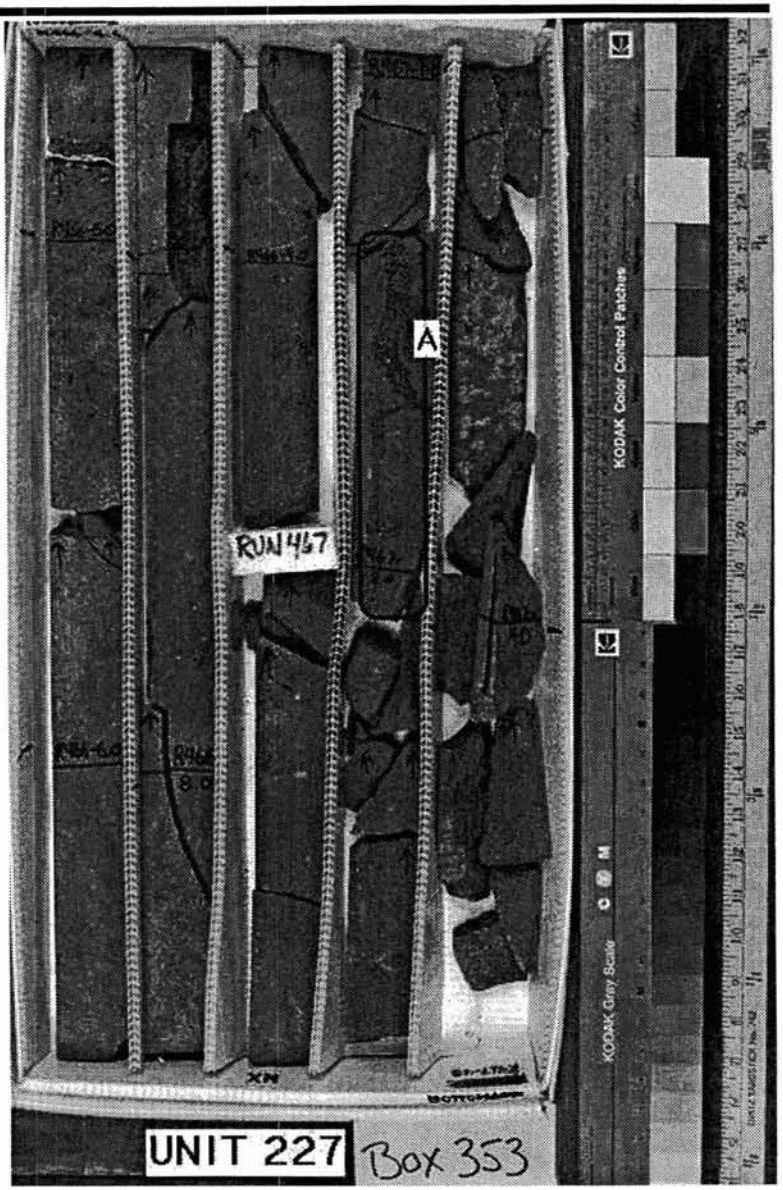
Driller's depth:top [feet]: 3451.6
Driller's depth:bottom [feet]: 3462.9
Core type: NQ

Units in box: 1

BOX UNIT 1: aphyric basalt

UNIT #:227

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(continuous with next box)
Unit type: massive
Phenocrysts/Clasts:
aphyric (<1%) – sparse olivine microphenocrysts
– – – –
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: medium gray – **Structures:** – **Sorting:** –
Vesicles: 5-10% – 0.5-1 mm – angular – equant –
bluish mineral (zeolite?)
Alteration: fresh (<2% altered) –
yellow and orange coatings on fractures, R467-3.0 to 4.7; bluish coatings, R466-4.7 to R467-1.1
Veins: none
Fractures: Weakly fractured: 18/8 ft, first 8' of box. Moderately fractured, last 2'.
Additional comments:
minor NaCl ppt
vertical segregation vein, R467-1.2 to 2.1, marked "A" on photo; horizontal segregation vesicles common



Box #:	Cores in box
354	467

Loggers:	MBB
Date logged:	12/12/93
Checked by:	MG
Check date:	12/14/93

Driller's depth:top [feet]:	3462.9
Driller's depth:bottom [feet]:	3464.0
Core type:	NQ
Units in box:	1

BOX UNIT 1: aphyric basalt **UNIT #:227**

Contacts: Top (ft): (R --')(continuous with previous box)
Bottom (ft): (R--')(end of core; T.D.)
Unit type: pahoehoe/transitional
unit displays both rounded, equant vesicles and horizontal vesicle trains
Phenocrysts/Clasts:
aphyric (<1%) –
olivine – ≤1% – 1-2 mm – equant –
<1% at R467-5.3; olivine microphenocrysts, both equant and bladed morphologies; olivines are slightly oxidized
– – – –
– – – –
Groundmass/Matrix: microcrystalline to fine-grained (<1 mm) –
Color: N4 medium dark gray – **Structures:** – **Sorting:** –
Vesicles: 20-30% – <1-5 mm – rounded to subrounded – equant to horizontally elongate–
vesicles vary in morphology and volume%, see photo
Alteration: fresh (<2% altered) –
Veins: none
Fractures: weakly fractured: 1/1 ft
Additional comments:
NaCl ppt; plagioclase in groundmass (seen with hand lens)